

Saving Lives on the Battlefield

**A Joint Trauma System Review of Pre-Hospital Trauma Care
in Combined Joint Operating Area – Afghanistan (CJOA-A)**

FINAL REPORT

30 January 2013

**U.S. Central Command
Pre-Hospital Trauma Care Assessment Team**

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“I hoped that something that I would say or do would save the life of at least one Ranger. If I accomplished that much I would consider myself successful.”

– COL Ralph Puckett

SECTION I. KEY QUESTIONS

From 2001 to 2011, combatant commanders assumed the risk of warfare at an average cost of approximately one life per day...notable is that every fourth day, the death was potentially preventable. With this point of reference, the following are questions to consider:

1. What makes military medicine unique?
2. Why do military medical providers exist?
3. What is the leading cause of death on the battlefield?
4. Where do most military service members die on the battlefield?
5. Where can we make the greatest difference in military casualty outcomes?
6. Do medical priorities, resources, and efforts match mission requirements?
7. What is the standard for pre-hospital battlefield trauma care?
8. Does our pre-hospital casualty response system meet or exceed standards?
9. How do we determine best practices in pre-hospital battlefield trauma care?
10. How do we develop clinical expertise in pre-hospital battlefield trauma care?
11. How do we train providers in trauma who do not routinely practice trauma?
12. Who is the advocate for medics and pre-hospital battlefield trauma care?
13. Who owns battlefield medicine?

SECTION II. EXECUTIVE SUMMARY

A. Background

During the Vietnam conflict, many U.S. casualties died because they failed to receive pre-hospital trauma care interventions as simple as placing a tourniquet on a bleeding extremity. A paper from the Vietnam era noted that: "...little if any improvement has been made in this (pre-hospital) phase of treatment of combat wounds in the past 100 years." This statement continued to be true until the development of Tactical Combat Casualty Care (TCCC) in 1996. TCCC is a set of pre-hospital trauma care guidelines customized for use on the battlefield.

One example of the lifesaving potential of TCCC guidelines is renewed focus on pre-hospital tourniquet use. Until recently military medics were taught that a tourniquet should be used only as a last resort to control extremity hemorrhage, yet a study of 2600 combat fatalities incurred during the Vietnam conflict and a study of 982 combat fatalities incurred during the early years of conflict in Afghanistan and Iraq noted death from extremity hemorrhage was relatively unchanged at 7.4% and 7.8% respectively. After the global implementation of the tourniquet recommendations from the TCCC guidelines, a recent comprehensive study of 4596 U.S. combat fatalities from 2001 to 2011 noted that only 2.6% of total combat fatalities resulted from extremity hemorrhage. This dramatic decrease in deaths from extremity hemorrhage resulted from ubiquitous fielding of modern tourniquets and aggressive training of all potential first responders on tourniquet application.

Currently, if you are a U.S. or Coalition casualty on the battlefield of Afghanistan and you arrive alive to a Role 3 Medical Treatment Facility (MTF), your chance of survival is greater than 98%. Although the overall case fatality rate in the ongoing conflict is lower in comparison to previous conflicts, significant challenges still remain. The comprehensive study of 4596 U.S. combat fatalities incurred in Afghanistan and Iraq from 2001 to 2011 mentioned above also found that 87% (4016/4596) of deaths occurred prior to reaching a MTF. This percentage remains relatively unchanged from the 88% noted from the Vietnam conflict. Additionally, of the pre-MTF fatalities, a panel of military medical experts determined that 24% (976/4016), or 1 in 4 of these deaths, were potentially preventable. Surgically correctable torso hemorrhage, junctional hemorrhage, airway compromise, and tension pneumothorax remain as significant challenges and causes of preventable death in the pre-hospital battlefield environment.

A recent study of combat casualties from the 75th Ranger Regiment, U.S. Army Special Operations Command, between 2001 and 2010 documented that 0% of their pre-MTF fatalities and 3% of their total fatalities were potentially preventable. This is largely attributable to the Ranger Casualty Response System, a Tactical Combat Casualty Care (TCCC) based program that is aggressively taught to all unit personnel. This casualty response system is a command-directed program that was in place prior to the onset of hostilities in Afghanistan in 2001. It has been continuously updated throughout the current conflict as guided by a unit-based trauma registry and by the expert recommendations from the Committee on TCCC. The unprecedented low incidence of preventable deaths achieved by the Ranger Casualty Response System is a model for improving pre-hospital trauma care and saving lives on the battlefield.

The Ranger system provides an example of how command ownership, comprehensive TCCC training at all levels, casualty data collection, and process improvement using Joint Trauma System principles can save lives when implemented. This system offers key insights into how

future improvements in battlefield trauma care and casualty survival can be made throughout the DoD. The 1993 Battle of Mogadishu provided invaluable lessons learned and led to dramatic changes in Ranger pre-hospital trauma care that have subsequently saved many Ranger lives on the battlefield. The current conflict has also provided invaluable lessons which can save lives now and on future battlefields if these techniques are uniformly implemented, well-trained, and well-executed by U.S. military forces.

B. Mission

Assess pre-hospital trauma care within the Combined Joint Operations Area - Afghanistan (CJOA-A) and provide recommendations to reduce preventable combat death among U.S., Coalition, and Afghan forces to the lowest incidence achievable.

C. U.S. Central Command Pre-Hospital Trauma Care Assessment Team

COL Russ S. Kotwal, MC, USA – Director, Trauma Care Delivery, Joint Trauma System
CAPT Frank K. Butler, MC, USN (Ret) – Chairman, Committee on Tactical Combat Casualty Care
COL Erin P. Edgar, MC, USA – Command Surgeon, U.S. Central Command
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CAPT Donald R. Bennett, MC, USN – Incoming Deployed Director, Joint Theater Trauma System, U.S. Central Command
Col Jeffrey A. Bailey, MC, USAF – Director, Joint Trauma System

D. Itinerary

5-6 Nov: Bagram Airfield: Role III (USAF, USA), Role II (USA)
6-7 Nov: Salerno FOB: Role II (USA, USAF), Role I (USA), TACEVAC (USA)
7-10 Nov: Bagram Airfield: Role I (USA), TACEVAC (USA)
8-9 Nov: JTTS Theater-Wide Trauma Conference (> 130 medical providers from AFG, DEU, FRA, NOR, UK, USA, USAF, USMC, USN)
10-11 Nov: Kandahar Airfield: Role III (USN), Role I (USA)
11 Nov: Tarin Kowt: Role II (USN), Role I (USN, AUS)
12-14 Nov: Bastion: Role III (UK, USA), Role I (UK, USA, USMC, USN), TACEVAC (UK, USAF)
14-17 Nov: Bagram Airfield: TACEVAC (USAF), JTTS, JC2RT

E. Selected Observations

1. Throughout the course of hostilities in Afghanistan, TCCC has gone from being used by only a few USSOCOM and 18th Airborne Corps units to being used throughout the battle space. This evolution has, however, occurred unevenly and sporadically.
2. There is incomplete fielding and use of updated TCCC technologies and techniques, even when these are desired by the combatant units and endorsed by the combatant unit medical leaders.

3. One reason for the apparent randomness of advances in pre-hospital trauma care is the lack of a clearly responsible organization for developing best-practice pre-hospital trauma care recommendations to the Services and Combatant Commanders.
4. A second reason for the apparent randomness of advances in pre-hospital trauma care is a matter of ownership, and the potential for decisions in this area to be made or not made by any number of different senior military leaders and at multiple levels within the chain of command of each service.
5. Combat medics serving at Role I are generally very familiar with TCCC principles. This is not reliably true for physicians, physician assistants, and nurses, since there is no DoD-wide requirement for them to receive this training.
6. Even Role I combat medical personnel who are familiar with TCCC techniques and equipment may not receive up-to-date TCCC training and equipping prior to deployment.
7. The lack of pre-hospital care documentation is a major obstacle to advancing pre-hospital trauma care. If you cannot document what was done, then you can't make evidence-based improvements. You can't improve what you can't measure, and you can't measure without data.
8. A clear opportunity for improvement exists in the area of providing an advanced casualty evacuation capability for severely injured casualties.
9. The key elements of an advanced casualty evacuation capability are: 1) a multi-provider team; 2) air and ground platforms that can support this team and its casualties; 3) the ability to perform Damage Control and Hemostatic Resuscitation with 1:1 PRBCs to plasma; 4) the ability to perform an array of advanced airway interventions; and 5) the ability to administer tranexamic acid (TXA).
10. A continuous review of all deaths in CJOA-A conducted as a combined effort of the Joint Trauma System and the Office of the Armed Forces Medical Examiner is needed to identify potentially preventable deaths among U.S. combat fatalities and enable necessary performance improvement efforts to be made in a timely manner.

F. Selected Recommendations (Sustains and Improves):

Secretary of Defense:

1. Command-direct an on-going 100% preventable death review and analysis of all combat-related fatalities to be conducted by a joint team from both the Armed Forces Medical Examiner and the Joint Trauma System.
2. Command-direct an on-going review and analysis of preventable deaths in CJOA-A as they relate to tactics, techniques, and procedures (TTPs), tactical trends, personal protective equipment (PPE), evolving injury patterns, and OPTEMPO through a consolidated registry of findings from formal tactical investigations and theater-wide tactical operations interfaced with the DoD Trauma Registry

3. Support designation of the Joint Trauma System (JTS) as a DoD Center of Excellence and as the lead agency for Trauma Care and Trauma Systems
4. Support TCCC realignment under JTS with POM support, and strengthen its role in providing best-practice pre-hospital trauma care recommendations
5. Develop a TCCC Rapid Fielding Initiative to fast-track new TCCC techniques & technology to deployed and deploying combatant units as requested.

Service and Combatant Commanders:

1. Line commander priority, emphasis, and understanding of their tactical casualty response system is critical to success (e.g. 75th Ranger Regiment Casualty Response model)
2. Train all combatant unit personnel in basic TCCC initially, annually, and within 6 months of combat deployment (e.g. USSOCOM Directive 350-29 model). This should be a requirement for deploying to a combat theater.
3. Train all medical personnel (physicians, PAs, nurses, medics) in instructor-level TCCC courses initially and within 6 months of combat deployment. This should be a requirement for deploying to a combat theater.
4. Integrate TCCC-based casualty response into battle drills, small unit tactics, and training exercises at all levels (e.g. 75th Ranger Regiment Casualty Response model).
5. Support enduring sustainment hands-on trauma training for all pre-hospital medical personnel (Live Tissue & Trauma Center Rotations) (e.g. USASOC Regulation 350-1 model)
6. Advance pre-hospital care and improve performance through Point-of-Injury (POI) care documentation (TCCC Casualty Card, JTS AAR, unit-based registries) directed by line commanders (e.g. 75th Ranger Regiment Casualty Response model)
7. Advance pre-hospital evacuation care and improve performance through TACEVAC care documentation (TCCC Casualty Card, Run Sheets) directed by line commanders
8. Emphasize contingency planning to ensure evacuation capabilities in non-permissive environments.

Service Surgeons General:

1. Sustain and expand initiative to train and sustain all tactical evacuation medics as Critical Care Flight Paramedics (e.g. 160th Special Operations Aviation Regiment (Airborne) model; AFSOC model; newly implemented AMEDD model)
2. Support and expand USFOR-A initiatives to develop an advanced tactical evacuation capability for the critically injured – blood, plasma, advanced airway interventions, advanced provider teams (e.g. UK MERT model)

Research and Development Commanders:

1. Elevate the priority of pre-hospital trauma care research and funding and emphasize the need for advances in non-compressible hemorrhage control and resuscitation of casualties in shock in the pre-hospital environment
2. As all on the battlefield have the potential to be a casualty and a first responder, explore information technology (IT) solutions for pre-hospital documentation that are first responder centric, not medic centric, and integrated into tactical communications in a manner that surpasses proven TCCC card method

CENTCOM Commander and Surgeon:

1. Continue support for the Joint Theater Trauma System (JTTS) Deployed Director position in CJOA-A.
2. Create and support the position of JTTS Pre-Hospital Care Director in CJOA-A to be filled by a physician with experience in POI pre-hospital combat trauma care
3. Minimize use of platelet-inhibiting drugs (e.g. aspirin, Motrin, other COX-1 NSAIDs, SSRIs) in individuals who leave secure areas for combat missions in CJOA-A
4. Expand TCCC-endorsed trauma guidelines, training, and use of 1) tranexamic acid (TXA); and 2) ketamine to all pre-hospital medical providers in CJOA-A (e.g. USSOCOM model)

G. Concluding Remarks:

Pre-hospital combat death can be prevented by combatant and medical leaders at multiple levels through:

1. **Primary prevention** – prevent injury incident through TTPs and evidence-based findings from tactical and medical After Action Reviews (AARs)
2. **Secondary prevention** – mitigate injury extent through tactical contingency planning and Personal Protective Equipment (PPE)
3. **Tertiary prevention** – optimize injury care through properly executed TCCC, optimized tactical casualty response (POI and Evacuation), and forward damage control resuscitation

Medically, the key to trauma care delivery is the time to a required (injury dictated) capability (successfully performed). However, ultimately, the solution to trauma care delivery, and subsequent reduction of preventable combat death, is **both tactical and medical**, and therefore must have the attention and support of combatant commanders.

SECTION III. FULL REPORT

A. BACKGROUND

During the Vietnam conflict, many U.S. casualties died because they failed to receive pre-hospital trauma care interventions as simple as placing a tourniquet on a bleeding extremity. A paper from the Vietnam era noted that: "...little if any improvement has been made in this (pre-hospital) phase of treatment of combat wounds in the past 100 years." This statement continued to be true until the development of Tactical Combat Casualty Care (TCCC) in 1996. TCCC is a set of pre-hospital trauma care guidelines customized for use on the battlefield.

[Maughon JS. An inquiry into the nature of wounds resulting in killed in action in Vietnam. Military Medicine 1970; 135:8-13; Butler FK, Hagmann J, Butler EG. Tactical combat casualty care in special operations. Military Medicine 1996; 161(suppl):1-15]

One example of the lifesaving potential of TCCC guidelines is renewed focus on pre-hospital tourniquet use. Until recently military medics were taught that a tourniquet should be used only as a last resort to control extremity hemorrhage, yet a study of 2600 combat fatalities incurred during the Vietnam conflict and a study of 982 combat fatalities incurred during the early years of conflict in Afghanistan and Iraq noted death from extremity hemorrhage was relatively unchanged at 7.4% and 7.8% respectively. After the global implementation of the tourniquet recommendations from the TCCC guidelines, a recent comprehensive study of 4596 U.S. combat fatalities from 2001 to 2011 noted that only 2.6% of total combat fatalities resulted from extremity hemorrhage. This dramatic decrease in deaths from extremity hemorrhage resulted from ubiquitous fielding of modern tourniquets and aggressive training of all potential first responders on tourniquet application. **[Maughon JS. An inquiry into the nature of wounds resulting in killed in action in Vietnam. Military Medicine 1970; 135:8-13; Kelly JF, Ritenhour AE, McLaughlin DF, et al. Injury severity and causes of death from Operation Iraqi Freedom and Operation Enduring Freedom: 2003-2004 versus 2006. Journal of Trauma 2008; 64:S21-S27; Eastridge BJ, Mabry RL, Seguin PG, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care. Journal of Trauma 2012; 73(6) Suppl 5: 431-7]**

Currently, if you are a U.S. or Coalition casualty on the battlefield of Afghanistan and you arrive alive to a Role 3 Medical Treatment Facility (MTF), your chance of survival is greater than 98%. Although the overall case fatality rate in the ongoing conflict is lower in comparison to previous conflicts, significant challenges still remain. The comprehensive study of 4596 U.S. combat fatalities incurred in Afghanistan and Iraq from 2001 to 2011 mentioned above also found that 87% (4016/4596) of deaths occurred prior to reaching a MTF. This percentage remains relatively unchanged from the 88% noted from the Vietnam conflict. Additionally, of the pre-MTF fatalities, a panel of military medical experts determined that 24% (976/4016), or 1 in 4 of these deaths, were potentially preventable. Surgically correctable torso hemorrhage, junctional hemorrhage, airway compromise, and tension pneumothorax remain as significant challenges and causes of preventable death in the pre-hospital battlefield environment. **[Eastridge BJ, Mabry RL, Seguin PG, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care. Journal of Trauma 2012; 73(6) Suppl 5: 431-7; Bellamy RF. The causes of death in conventional land warfare: implications for combat casualty care research. Military Medicine 1984; 149(2):55-62]**

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The Ranger system provides an example of how command ownership, comprehensive TCCC training at all levels, casualty data collection, and process improvement using Joint Trauma System principles can save lives when implemented. This system offers key insights into how future improvements in battlefield trauma care and casualty survival can be made throughout the DoD. The 1993 Battle of Mogadishu provided invaluable lessons learned and led to dramatic changes in Ranger pre-hospital trauma care that have subsequently saved many Ranger lives on the battlefield. The current conflict has also provided invaluable lessons which can save lives now and on future battlefields if these techniques are uniformly implemented, well-trained, and well-executed by U.S. military forces.

B. MISSION

Assess pre-hospital trauma care within the Combined Joint Operations Area - Afghanistan (CJOA-A) and provide recommendations to reduce preventable combat death among U.S., Coalition, and Afghan forces to the lowest incidence achievable.

C. INTENT

To discuss and observe pre-hospital trauma care tactics, techniques, and procedures conducted in the combat environment, and as obtained directly from deployed pre-hospital providers, medical leaders, and combatant leaders from various US military services as well as Coalition partners.

The overall goal of this assessment is to provide recommendations that will reduce preventable combat death among US, Coalition, and Afghan forces to the lowest incidence achievable. Three primary areas of focus include: 1) identify best practices that can be cross-leveled among the force, 2) identify actionable areas of performance improvement that will optimize pre-hospital trauma care timing, delivery, and casualty survivability, and 3) identify potential gaps in pre-hospital trauma care, data and performance improvement, tactical evacuation, personnel, training, equipment, medications, research, and technology that merit priority for advancement of pre-hospital trauma care delivery.

D. DELIVERABLES

1. Command Slide Brief to CENTCOM by 1 DEC 2012; update and synch by 30 JAN 2013
2. Executive Summary to CENTCOM by 20 DEC 2012; update and synch by 30 JAN 2013
3. Final Report to CENTCOM by 20 JAN 2013; update and synch by 30 JAN 2013

E. TEAM

Theater Traveling Team:

COL Russ S. Kotwal, MC, USA – Director, Trauma Care Delivery, Joint Trauma System
CAPT Frank K. Butler, MC, USN (Ret) – Chairman, Committee on Tactical Combat Casualty Care

COL Erin P. Edgar, MC, USA – Command Surgeon, U.S. Central Command
Col Stacy A. Shackelford, MC, USAF – Outgoing Deployed Director, Joint Theater Trauma System, U.S. Central Command

CAPT Donald R. Bennett, MC, USN – Incoming Deployed Director, Joint Theater Trauma System, U.S. Central Command

Support Team:

Col Jeffrey A. Bailey, MC, USAF – Director, Joint Trauma System

Ms Mary A. Spott – Deputy Director, Joint Trauma System

COL Kirby Gross, MC, USA – Director, Performance Improvement, Joint Trauma System

LTC Kimberlie A. Biever, AN, USA – Director, Enroute Critical Care, Joint Trauma System

LTC Robert L. Mabry, MC, USA – Director, Military EMS and Pre-Hospital Medicine Fellowship

MSG Dominique J. Greydanus, 18D, NREMT-P, USA (Ret) – Joint Trauma System

F. ITINERARY

5-6 Nov: Bagram Airfield: Role III (USAF, USA), Role II (USA)

6-7 Nov: Salerno FOB: Role II (USA, USAF), Role I (USA), TACEVAC (USA)

7-10 Nov: Bagram Airfield: Role I (USA), TACEVAC (USA)

8-9 Nov: JTTS Theater-Wide Trauma Conference (> 130 medical providers from
AFG, DEU, FRA, NOR, UK, USA, USAF, USMC, USN)

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11 Nov: Tarin Kowt: Role II (USN), Role I (USN, AUS)

12-14 Nov: Bastion: Role III (UK, USA), Role I (UK, USA, USMC, USN), TACEVAC (UK, USAF)

14-17 Nov: Bagram Airfield: TACEVAC (USAF), JTTS, JC2RT

G. DETAILED ITINERARY

2-3 NOV 2012: Transportation: Air travel from Washington Dulles through Dubai to Doha via Boeing 777, Flight # 976, with follow-on ground travel from Doha Airport to Camp As-Saliyah.

4 NOV 2012: Awaiting transportation.

5 NOV 2012: Transportation: Ground travel from Camp As-Saliyah to Al-Udeid AB, with follow-on air travel from Al Udeid AB to BAF via USAF C130, Flight # F9346A, Tail # 741660, 0800-

1245hrs. Meetings at BAF: 1) JTTS, 2) US Role II (USA medical leader and provider), 3) 30th Medical Brigade (USA medical leaders and providers), 4) US Role III (USAF and USA medical leaders and providers).

6 NOV 2012: Transportation: Air travel from BAF to SAL, Dash 8-100, Tail # N638AR, 1005-1035hrs. Meetings at SAL: 1) US Role II (USA and USAF medical leaders and providers), 2) US Role I – Combatant Unit 1 (USA medical leaders and pre-hospital providers), 3) US Role I (USA MEDEVAC providers), 4) US Role I – Combatant Unit 2 (USA combatant leaders and medical leaders, and USA and USAF pre-hospital providers)

7 NOV 2012: Transportation: Air travel from SAL to BAF, Dash 8-100, Tail # N638AR, 1021-1051hrs. Meetings at BAF: 1) US Role I – Combatant Unit (USA medical leaders), 2) US Role I – Combatant Unit HQ (USA medical leaders and pre-hospital providers), 3) US Role I (USA MEDEVAC leaders and pre-hospital providers).

8 NOV 2012: Conference at BAF: Day 1 of the Trauma Conference: “Bridging the gap between in and out of hospital care,” hosted by JTTS at BAF Chapel, attendance and presentations from Role I-III (US, Coalition, and Afghan Partners). Meeting at BAF: US Role I (USA and USAF medics from multiple combatant units).

9 NOV 2012: Conference at BAF: Day 2 of the Trauma Conference: “Bridging the gap between in and out of hospital care,” hosted by JTTS at BAF Chapel, attendance and presentations from Role I-III (U.S., Coalition, and Afghan Partners). Meeting at BAF: US Role I (USA and USAF medics from multiple combatant units).

10 NOV 2012: Transportation: Air travel from BAF to KAF, Dash 8-100, Tail # N635AR, 0745-0855hrs. Meetings at KAF: 1) US Role III (USN medical leaders and providers), 2) US Role I – Combatant Unit HQ (USA medical leaders and pre-hospital providers), 3) US Role I – Combatant Unit (USA combatant leaders, medical leaders, pre-hospital providers and combatants at multiple levels).

11 NOV 2012: Transportation: Air travel from KAF to Tarin Kowt, CH47F, Tail # 05-08010, 0833-0946hrs. Meetings at Tarin Kowt: 1) US Role I – Combatant Unit (USN combatant leaders, medical leaders, and pre-hospital providers), 2) US Role II (USN medical leaders and providers), 3) Australian Role I (medical leaders and pre-hospital providers). Transportation: Air travel from Tarin Kowt to KAF, C130, Tail # 686, 2021-2044hrs.

12 NOV 2012: Transportation: Air travel from KAF to Bastion, C130, Tail # B583, Danish RAF, 0926-1012hrs. Meetings at Bastion: 1) UK Role III (UK and US medical leaders and providers), 2) JTTS, 3) UK Role I (medical leaders, pre-hospital providers), 4) US Role I – Combatant Unit (USA line leaders).

13-14 NOV 2012: Meetings at Bastion: 1) UK Role III (UK and US medical leaders and providers), 2) UK Role I (RAF MERT medical leaders, providers, and force protection combatants), 3) US Role I (USAF CSAR and CASEVAC leaders and providers), 4) US Role I (USN and USMC medical leaders and pre-hospital providers). Transportation: Air travel from Bastion to BAF, KC130J, Tail # QB7985, 2314-0022hrs.

14 NOV 2012: Meetings at BAF: 1) US Role I (USAF CSAR and CASEVAC leaders and providers).

15-16 NOV 2012: Meetings at BAF: Discussed six PI projects, 5 pre-hospital and 1 hospital.

17 NOV 2012: Transportation: Air travel from BAF to Al-Udeid AB via USAF C130, Tail # 660, 0010-0502hrs, with follow-on ground travel from Al-Udeid AB to Camp As-Saliyah to Al-Udeid AB.

18-19 NOV 2012: Transportation: Ground travel from Camp As-Saliyah to Doha Airport, with follow-on air travel from Doha through Dubai to Washington Dulles via Boeing 777, Flight # 977.

H. OBSERVATIONS

Pre-Hospital Trauma Care:

1. In the US, trauma accounts for 42 million emergency department visits, 2 million hospital admissions, 172,000 deaths, and an economic burden of \$406 billion in health care costs and lost productivity each year. Trauma is number one for the amount of life-years lost in the US, which is more than cancer, heart disease, and HIV combined. Trauma is the number one cause of death for those in the 1-44 age group; accounting for 47% of deaths. (Source: National Trauma Institute and Center for Disease Control) Trauma is the number one cause of death for active duty military. Trauma is the number one cause of death on the battlefield, and 87% of these battlefield deaths occur in the pre-hospital environment. Commensurate priority and funding should exist for trauma care training, equipment, research, and technologies, especially as it pertains to pre-hospital trauma care. (JTS Trauma Care Delivery Director)
2. Combatant unit commanders control the time, budget, personnel, training, and equipment for pre-hospital casualty response systems and trauma care. Thus, combatant unit commanders should own and be responsible for their casualty response systems. (Role I – 75th Ranger Regiment)
3. A review of the status of pre-hospital trauma care in combat theaters should be conducted on a regular basis to continue to look for opportunities to reduce preventable deaths among combat casualties. (JTS Director)
4. Throughout the course of hostilities in Afghanistan, TCCC has gone from being used by only a few USSOCOM and 18th Airborne Corps units to being used throughout the battle space. This evolution has, however, occurred unevenly and sporadically. (CENTCOM Surgeon)
5. There is incomplete fielding and use of updated TCCC technologies and techniques, even when these are desired by combatant units and endorsed by combatant unit medical leaders. (Salerno Role I – 101st Airborne Division (Air Assault); Salerno Role I – DUSTOFF)
6. One reason for the apparent randomness of advances in pre-hospital trauma care is the lack of a clearly responsible organization for developing best-practice pre-hospital trauma care recommendations to the Services and Combatant Commanders. (CoTCCC Chairman)
7. A second reason for the apparent randomness of advances in pre-hospital trauma care is a matter of ownership, and the potential for decisions in this area to be made or not made by any number of different senior military leaders and at multiple levels within the chain of command of each service. (CoTCCC Chairman)

8. Current deployed forces were aware of recent TCCC updates. This was due in large part to the efforts of the JTTS Deployed Director. This effort required a large amount of her available time. (JTTS Deployed Director) A JTTS Pre-Hospital Care Director would prove most beneficial in theater. (JTS Director)
9. Modifications downgrading TCCC recommendations were made by some units to reflect their concerns about 68W medics administering IV medications such as analgesics (morphine, ketamine) and antibiotics (ertapenem). (BAF Role I – 1st Infantry Division) Medics should be trained and equipped to meet battlefield requirements. (JTS Trauma Care Delivery Director)
10. The current standard for pre-hospital trauma care delivery on the battlefield is TCCC. This standard is continuously reviewed and updated by a committee of world-renowned traumatologists; however, medical administrators impose restrictions on first responders and medics that limit their ability to fully provide TCCC to their buddies on the battlefield. (JTS Trauma Care Delivery Director)
11. A recent medical article [Harris M, Baba R, Nahouraii R, Gould P. **Self-induced bleeding diathesis in soldiers at a FOB in South Eastern Afghanistan. Military Medicine 2012; 177:928-9**] showed that approximately 75% of troops at a Forward Operating Base (FOB) in Southeastern Afghanistan were taking aspirin or NSAIDs and were likely to have a self-induced coagulopathy. This was confirmed to still be true by multiple units interviewed. (Role I – 1st Infantry Division, 3rd Infantry Division, 101st Airborne Division (AASLT), 173rd Airborne Brigade Combat Team, CJSOTF, 75th Ranger Regiment) Our troops are using lots of Motrin. (KAF Role I – 3rd Infantry Division) Almost everybody in this unit take Motrin. (Bastion Role I – USAF Combat Rescue Officer)
12. The current TCCC recommendation for fluid resuscitation before blood products become available is hypotensive resuscitation with Hextend. Permissive hypotension was used as far back as WWI (Cannon 1918), and Bickell showed that aggressive pre-hospital fluid resuscitation with crystalloids increased mortality compared to no pre-hospital fluids. (Theater Trauma Conference – Shadow DUSTOFF CRNA)
13. The use of large volume crystalloid IV fluid resuscitation for casualties in shock was not practiced by all but one of the units interviewed. Not providing large volume IV fluid crystalloid resuscitation is a long-standing principle of care in TCCC that is now being adopted widely in the civilian community as well. It was a point of emphasis by FORSCOM and TRADOC in the recent past.
14. Not one study has shown any survival benefit from pre-hospital resuscitation of patients in hemorrhagic shock with crystalloids. (Theater Trauma Conference – BAF Role III Trauma Surgeon)
15. If a black box warning exists to not use lactated ringers IV fluid in patients with metabolic acidosis, then why do some continue to use lactated ringers in trauma patients who have a propensity toward metabolic acidosis? (JTS Trauma Care Delivery Director)
16. “Tourniquets have been very successful. In Iraq, 5 years ago, I saw casualties come in in shock and dying from single extremity injuries without tourniquets. Here, we are seeing triple and quadruple amputees come in with tourniquets applied, awake and talking to us.” (KAF Role III – Neurosurgeon)

17. Tourniquet training in some TCCC courses is to place them "high and tight" on the extremity regardless of where the wound is. (Role III – BAF, KAF, Bastion; Role I – 1st Infantry Division, 3rd Infantry Division, 1 MEF) A tourniquet was recently placed high on the bicep for an amputated finger. (Bastion Role I – USA) This application technique combined with prolonged tourniquet time has been associated with complications in at least two non-US casualties as noted in correspondence from the JTTS Deployed Director. Consider providing additional TCCC guidance on tourniquet placement. (Bastion Role I – USA) If a "high and tight" tourniquet is placed during care under fire, emphasize reassessment and repositioning at the earliest opportunity during tactical field care. (JTTS Deployed Director)
18. Successful prevention of hypothermia, and minimal base deficit upon arrival to an MTF, are good indicators of quality pre-hospital trauma care. (JTTS Deployed Director).
19. A combat zone is not the place to practice your skills - this is the Superbowl. The most skilled provider available should perform each procedure, i.e. a combat deployment is not a training environment. Anesthesia always intubates, general surgery always places chest tubes, etc. (KAF Role III – Surgeon)
20. Four recent casualties came in with surgical airways, with only one done correctly. Several were performed on casualties with GSW to head. More basic airway management techniques may be more appropriate for these casualties. The current TCCC emphasis on not performing surgical airways unless there is an observed airway obstruction should be reinforced. (KAF Role III – Surgeon)
21. Tranexamic acid (TXA) was developed decades ago in Japan. It binds to lysine sites on plasminogen. It is FDA-approved for oral use in women with menorrhagia. It is a safe medication; there is one case report of a 17 y/o girl who took 37 gms of TXA. The patient recovered after supportive care. The London HEMS service carries and uses TXA pre-hospital. TXA may be the best intervention available for pre-hospital care of patients with junctional and truncal hemorrhage. (Theater Trauma Conference – V Corps Physician Assistant)
22. Improving outcomes in bleeding casualties is best accomplished by stopping the bleeding NOW, and that means equipping first responders with TXA. (Theater Trauma Conference – V Corps Command Surgeon)
23. Individual combatants are allowed to carry morphine autoinjectors in some units. Corpsmen and medics are not allowed to carry and give TXA in most units. There is more potential risk to the casualty from using an autoinjector of morphine than from giving TXA. (CoTCCC Chairman)
24. Take home points on POI trauma care: 1) get the Tourniquet on right; 2) humeral IO insertions can be difficult; and 3) use more ketamine. Doubt that TBI and eye injury are really contraindications to ketamine use. C-spine may not be able to be cleared if casualty received ketamine. (Theater Trauma Conference – KAF Role III Navy EM Physician)
25. The trauma survival rates for US and Coalition forces in Afghanistan are better than in any other country in the world at present. "Afghanistan is right now the best place in the world to be wounded." (Theater Trauma Conference – BG Juergen Brandenstein, ISAF Surgeon)
26. Battalion aid stations are set up to accommodate sick call care, instead of trauma care. Is this a function of how we set up garrison aid stations? Is this also a resultant function of dismantling garrison aid stations and integrating combatant unit medical personnel into MTF

clinics? We fight as we train, thus we must train as we would fight. It is a matter of conditioning. (JTS Trauma Care Delivery Director)

27. Given the increased rate of infections for those admitted to an ICU versus a Ward after trauma, hypovolemic shock likely plays a role along with trauma care. The care provided in the environment at POI through the time the casualty reaches a surgeon is not well characterized. This needs to be evaluated to assess the various influences on infection and possible areas that could be modified to improve casualty care and subsequent outcomes. (Theater Trauma Conference – SAMMC Chief of Infectious Disease)

28. Systemic antibiotics should be given to combat casualties with open wounds as soon as possible. The TCCC recommendations for POI antibiotics are appropriate. (Theater Trauma Conference – SAMMC Chief of Infectious Disease)

29. Good and creative head wraps are being applied by Role I personnel for hemostasis. (Role III – KAF Neurosurgeon)

30. Flexible forward surgical teams should be provided for deliberate named combat operations. The need for the mobile surgical support will increase as fixed forward surgical teams are downsized. (Role I – 3rd Infantry Division)

31. The UK guidelines are the UK version of the U.S. Joint Trauma System Clinical Practice Guidelines. Recommended reading: Joint Doctrine Publication 4-03.1 Clinical Guidelines for Operations which is produced by the UK Ministry of Defence and available at the following URL: <https://www.gov.uk/government/publications/jdp-4-03-1-clinical-guidelines-for-operations>

32. As junctional tourniquets are developed and applied at Role I, we need to be cognizant of coexisting pelvic fractures with subsequent consequences and potential complications resulting from junctional tourniquet application. (Bastion Role III – UK)

33. Mild TBI training is overemphasized during pre-deployment training - so much so that medics and first responders have an inappropriate view of the criticality of this injury; training in the administration of the MACE has been emphasized more than tourniquet training in some units. Mild TBI is also the primary reason for over-calling the urgency of evacuations. Mild TBI should be considered a Category C evacuation. (JTTS Deployed Director) There is little to no evidence demonstrating improved outcomes in casualties with isolated mild TBI as a result of first responder interventions in the tactical setting. (CoTCCC Chairman)

34. The experience with ketamine as a battlefield analgesic has been very good to date. (Salerno Role I – 101st; BAF Role I – CJSOTF, BAF Role I – Shadow DUSTOFF, Tarin Kowt Role I - NSW) Ketamine does not cause cardiorespiratory depression as opioids do and is, therefore, well-suited for casualties in pain who are also in shock or at risk for going into shock. (CoTCCC Chairman) From August 2011 to August 2012, the DoD Trauma Registry recorded 93 administrations of ketamine to combat casualties in the pre-hospital battlefield environment with no complications noted. (JTS Trauma Care Delivery Director)

35. Experience by Role I providers with OTFC has been good. Casualties must be directed NOT to chew them, especially Afghan casualties. (BAF Role I – CJSOTF) Oral mucosa absorption accounts for half of the total absorbed dose and is responsible for OTFC's rapid onset. **[Kotwal RS, O'Connor KC, Johnson TR, Mosely DS, Meyer DE, Holcomb JB. A**

novel pain management strategy for combat casualty care. Annals of Emergency Medicine 2004; 44(2): 121-7]

36. Loss of consciousness in the absence of airway obstruction is not an indication for a surgical airway. TCCC should clarify this point in the airway algorithm. (BAF Role I – CJSOTF)

37. Ground medics need to know to fill cricothyroidotomy or ET tube cuffs with saline for air evacuation; otherwise the inflated cuffs will expand at altitude. This has been a problem seven times in the recent past. (BAF Role I – USAF Senior PJ)

38. The two main causes of preventable death in the conflicts in Afghanistan and Iraq are non-compressible torso hemorrhage and junctional hemorrhage. **[Eastridge BJ, Mabry RL, Seguin PG, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care. Journal of Trauma 2012, 73(6) Suppl 5: 431-7]** Medics are asking for technologies and strategies to prevent death from these two causes. (Role I – 75th Ranger Regiment)

39. The TCCC battlefield analgesia options should be simplified. Consider reducing the pre-hospital pain management protocol to three treatment options: 1) Able to fight - Mobic and Tylenol, 2) Unable to fight and in no risk of shock – OTFC 800 mcg, 3) Unable to fight and in or at risk of shock – Ketamine 50 mg IM. (BAF Role I – CJSOTF; BAF Role I – 1st Infantry Division)

40. Many decisions about the specific aspects of battlefield trauma care are made at the brigade or battalion level. (BAF Role I – 1st Infantry Division, BAF Role I – Shadow DUSTOFF)

41. Multiple SEAL medics have commented on the robust nature of the Ranger Casualty Response Program. Ranger leaders assume risk for pre-hospital trauma care initiatives, training, and innovation. They also embolden their medics. (Tarin Kowt Role I – NSW Physician Assistant)

42. Some of the unit-based pre-hospital trauma care protocols reviewed were clearly in error. One was noted to call for copious irrigation of an eye with suspected penetrating ocular injury. (CoTCCC Chairman) Also, several pre-hospital protocols recommend 2 liters of LR for casualties in shock, which is at odds with current concepts of hemostatic resuscitation that call for minimizing the use of crystalloids during resuscitation. (JTTS Deployed Director)

43. Some medics in other services have been noted to carry their tourniquets in lower leg or ankle locations. This is a bad practice since the lower leg is often lost in dismounted IED attacks. (Bastion Role I – USMC/USN corpsmen)

44. A note on teaching trauma care to new corpsmen: “Don’t go for the ugly – go for the bleeding.” (Bastion Role I – USMC/USN corpsmen)

45. UK hospital personnel discussed a recent pediatric IED casualty. The patient suffered bilateral globe injuries as well as bilateral TM injuries. Role I personnel should understand that IED casualties may not be able to either see or hear after the injuring event. (Bastion Role III – UK physicians)

46. There are opportunities to improve in pre-hospital trauma care. A recent casualty came in with a foley catheter when there was no indication for this intervention. The balloon was blown

up in the urethra and resulted in a ruptured urethra. Additionally, this patient came in without IV access. (KAF Role III – Trauma Surgeon)

47. There was a recent case of a casualty who suffered rhabdomyolysis. The casualty had a tourniquet that had been left in place for an estimated 7-8hrs. There was an evacuation delay due to enemy fire. The casualty did not lose the leg but had renal injury as a result of the rhabdomyolysis. (KAF Role III)

48. Almost all tourniquets are effective, but some are placed very high on the extremity. Ketamine is fantastic for pain, but limits the neurological exam more than opioids. One point about tourniquets is that care should be taken to not get the skin flap caught under the tourniquet. Reinforce the TCCC point about removing items from cargo pants pockets. Combat medics are doing a great job of saving DCBI casualties. Blast boxers are making a tremendous difference in preserving external genitalia in blast injuries. This success is largely due to the great job done by the previous 82nd Airborne Division Surgeon in spearheading this initiative. (KAF Role III – Trauma Director)

49. COL Rob Russell, a prominent UK military physician with extensive personal experience with using TXA in theater, on TXA recommendation for trauma care: “Give it to all evacuation platforms. Give it to Casualty Collection Points and Battalion Aid Stations. Give it to medics if they may be doing extended field care. Quote me.” (Bastion Role III – UK)

50. The military medical community has Role III MTFs in Afghanistan that provide trauma care that rivals world-class civilian trauma centers. The greatest improvement in trauma care survival can be realized by directing more effort toward Role II and Role I. A paradigm shift in focus is required. Physicians and nurses understand and are comfortable with hospital and clinic care; however, military physicians and nurses also need to understand and be comfortable with pre-hospital care, especially as it pertains to the battlefield. Trauma care delivery between Role I and Role II/III is currently not seamless. (JTS Trauma Care Delivery Director)

51. The Joint Trauma System (JTS) and the DoD Trauma Registry are as described, Joint and DoD. As such, the JTS must perceive and be perceived as a Service-neutral entity. The JTS must operate with agile access and accessibility to the Services and the COCOMS. Under the current construct, having the JTS operate as a component of the Joint Surgeon's Office best meets these requirements. However, the JTS should maintain its current operating location. (Joint Trauma System Director)

Data and Performance Improvement

52. “An after action review (AAR) always followed a training exercise. When appropriate I compared my combat experience to what the regiment was doing. I suggested improvements and used combat examples where violations of fundamentals had resulted in unnecessary casualties. I hoped that something that I would say or do would save the life of at least one Ranger. If I accomplished that much I would consider myself successful.” (COL Ralph Puckett, Words of Wisdom: A Professional Soldier's Notebook, 2007) AARs should always immediately follow a training exercise or combat mission. Role I personnel should use “Casualty AARs” to capture and share information for performance improvement of fundamental combat tactics, casualty response systems, and trauma care delivery. (JTS Trauma Care Delivery Director)

53. A continuous review of all deaths in CJOA-A conducted as a combined effort of the Joint Trauma System and the Office of the Armed Forces Medical Examiner is needed to identify potentially preventable deaths among U.S. combat fatalities and to enable necessary performance improvement efforts to be made in a timely manner. (JTS Director)
54. Combatant leaders have requested better availability of information concerning the status of recently injured members of their units. (Role I – 25th Infantry Division Combatant Leader, 101st Airborne Division (AASLT) Combatant Leader) USSOCOM has liaisons collocated with Role III, Role IV, and Role V MTFs to assist with this issue. (BAF Role I – CJSOTF)
55. Combatant unit commanders and medical providers desire feedback on their pre-hospital trauma care performance, documentation, and evacuation. (Role I – 1st Infantry Division, 3rd Infantry Division, 101st Airborne Division (AASLT), 173rd ABCT, CJSOTF, 75th Ranger Regiment) Consider providing feedback by region, service, and unit command.
56. The lack of pre-hospital care documentation is a major obstacle to advancing pre-hospital trauma care. If you cannot document what was done, then you can't make evidence-based improvements. You can't improve what you can't measure, and you can't measure without data. (Military EMS and Pre-Hospital Medicine Fellowship Director)
57. Evidence-based best-practice protocols improve outcomes, standardization improves outcomes. (BAF Role III Trauma Surgeon) Outcomes are measured through morbidity and mortality.
58. Little to no medical records are received from most Role I units and personnel. (BAF, KAF, Bastion Role III – multiple medical providers)
59. Documenting POI casualty care is too difficult and should not be expected. (Multiple Role I, II, III providers)
60. Tactical evacuation is often occurring too quickly to complete POI TCCC interventions and TCCC card. (Kandahar Role I – 3rd Infantry Division)
61. The 75th Ranger Regiment obtained POI casualty care documentation (TCCC Card and/or Casualty AAR) for 74% of casualties in Afghanistan and Iraq from 2001 to 2010. **[Kotwal RS, Montgomery HR, Kotwal BM, et al. Eliminating preventable death on the battlefield. Archives of Surgery 2011, 146(12): 1350-8.]**
62. For FY 2012 in Afghanistan, nearly 100% of 75th Ranger Regiment combat casualties had POI documentation (TCCC Card and/or Casualty AAR); however, only 14.7% of total combat casualties entered into the DoD Trauma Registry during the same time frame had POI documentation available. You cannot improve performance without measuring performance; you cannot measure performance without data. Data collection and analysis comes with an initial cost – Mandate, Monies, and Manpower. However, in the long run it is cost-effective as data and timely data analysis will improve command decisions and direct procurement appropriately for personnel, training, and equipment. (JTS Trauma Care Delivery Director)
63. The TCCC casualty card has a proven record of success in the 75th Ranger Regiment and follows the battlefield axiom of keeping things simple, but electronic solutions for documenting pre-hospital trauma care may also be useful. (BAF Role I – 1st Infantry Division) As all have the potential to be a casualty and all have the potential to be a first responder on the battlefield, pre-

hospital casualty care documentation solutions must be available to all potential first responders and not just medical providers. (Role I – 75th Ranger Regiment Combatant Leader)

64. The weekly JTS trauma teleconference is well-attended by all providers in the spectrum of combat casualty care, except POI providers. Additionally, nominal input and data is received from Role I providers for this conference. As 87% of pre-hospital death occurs in the pre-MTF environment, with 24% potentially preventable, strongly recommend increase in POI provider involvement in this conference. (JTS Trauma Care Delivery Director)

65. The weekly JTS trauma teleconferences on occasion note that casualties who are given opioids are either in shock when the medication is administered or become hypotensive subsequently. No studies have been published from the current conflict that review outcomes in combat casualties as a function of the type and route of analgesia used in combat casualties as well as the type and severity of wounds sustained, and physiologic parameters indicative of circulatory or respiratory status. (CoTCCC Chairman)

66. Significant amounts of static tactical and medical information and data is being generated on the battlefield by multiple units in multiple forums on multiple systems. Email messages are a prime example of static information. This information must become dynamic. Information Technology systems must be employed to optimize the consolidation, synthesis, and analysis of information and data for tactical and medical performance improvement. (JTS Trauma Care Delivery Director)

67. Combatant units and Role I personnel utilize classified telecommunications and computer systems routinely at home station and extensively while deployed. MTF personnel have more limited access, especially at home station, which diminishes communication ability with Role I personnel for casualty updates and transfer of information.

68. There is currently no review or preventable death analysis done on casualties who are killed in action and never admitted to a Role III facility. (Role III – KAF)

69. The medical community must continue to improve its ability to utilize, analyze, and distribute information, data, and trends in near-real time in order to optimize timeliness of performance improvement initiatives that save lives.

Evacuation

70. The Tactical Evacuation (TACEVAC) phase of care includes both Casualty Evacuation (CASEVAC) and Medical Evacuation (MEDEVAC). “At the tactical level, organic, or direct support CASEVAC and/or MEDEVAC resources locate, acquire, treat, and evacuate military personnel from the point of injury or wounding to an appropriate MTF.” (Source: Joint Publication 4-02, Health Service Support, 26 July 2012)

71. A clear opportunity for performance improvement exists in the area of providing an advanced casualty evacuation capability for severely injured casualties. (Forward Aeromedical Evacuation “FAME” study pending publication)

72. The key elements of an advanced casualty evacuation capability are: 1) a multi-provider team; 2) air and ground platforms that can support this team and its casualties; 3) the ability to perform Damage Control and Hemostatic Resuscitation with 1:1 PRBCs to plasma; 4) the ability

to perform an array of advanced airway interventions; and 5) the ability to administer tranexamic acid (TXA).

73. The Medical Emergency Response Team (MERT) is the UK combat air ambulance. The MERT was started in 2006 during Operation Herrick 4 in Afghanistan. The concept was first put into place by Col Martin Nadin. Currently, MERT provides 24/7 area coverage (15 minute notice during the day; 30 minute notice at night) with two dedicated casualty evacuation platforms and two groups of 17 personnel. Each group consists of 8 MERT medical personnel, 4 Force Protection personnel, and 5 crew personnel. The 8 MERT medical personnel provide two teams of 4 personnel, with each 4-man team consisting of an emergency medicine physician or anesthesiologist, an emergency medicine flight nurse, and two paramedics. The 4 Force Protection personnel are gunners (riflemen) who are trained to the team medic level and who rotate between QRF, MERT, and Tower duties; one is a commander lance corporal or corporal, and the others are senior air craftsmen. The 5 crew personnel consist of two pilots, two side-door gunners, and a tail gunner who also serves as the “loadie” crew chief. (Bastion Role I – UK MERT)

74. The USAF Pedro & Guardian Angel Team primarily provides Combat Search and Rescue (CSAR) support and secondarily provides casualty evacuation (CASEVAC) support. In support of the CASEVAC mission, two aircraft will deploy with 7 personnel on each aircraft. The team consists of two pilots, two gunners, and two Pararescue Jumpers (PJs) and one Combat Rescue Officer (CRO) on the lead aircraft and three PJs on the trail aircraft. The CRO is an aircrew member who is qualified on the aircraft and provides communications, command, and control with his own radio, not the aircraft radio. PJs train and sustain at the EMT-P level. CROs receive initial and annual TCCC training, and some also receive EMT-B training depending on the unit. Medical equipment includes Propac electronic monitors, Golden Hour boxes, 2 D cylinders of oxygen, blood components or Hextend (no LR or NS); hypothermia prevention through Ranger Rescue Wrap (heavy sleeping bag, 360 degree access, active heating pads) and wool blanket; they use ketamine liberally and consider it the best option for analgesia in combat casualties. (Bastion Role I – USAF Pararescue)

75. Category A evacuations currently comprise 70% of all evacuations in CJOA-A. (Shadow DUSTOFF) Need to ensure that evacuations are categorized correctly. Many evacuations are assigned a priority higher than what is actually required for their wounds. (JTTS Deployed Director) To help ground medics to better advise their mission commanders, who typically call in the 9-lines, a list of evacuation categories and examples of injury patterns each has been compiled by the JTTS Deployed Director and included in the revised TCCC curriculum.

76. It was also noted that some evacuations may be assigned a higher category than their injuries would normally warrant because of tactical considerations and follow-on mission requirements. Consider adding an evacuation category for “Tactical” mission requirements.

77. The current US 60-minute evacuation time requirement refers to the mission time after the 9-line evacuation request is approved. There can be delays before the 9-line is sent and occasionally in the approval process as well. (BAF Role I – USAF Pararescue)

78. Consider combining and requiring a “MIST” Report for 9-line MEDEVAC requests. (MIST = Mechanism of Injury, Injuries, Signs/Symptoms, Treatments).

79. No one will argue against blood component therapy as the fluid of choice for hemorrhagic shock, but there is no good evidence at present that giving blood products pre-hospital improves

outcomes. The UK MERT CASEVAC has been giving blood products during TACEVAC for several years, and USAF Pararescue CASEVAC and USA DUSTOFF MEDEVAC are now doing it as well. EMT-B medics can be trained to provide blood component therapy. Preparations for transfusion should be accomplished prior to arrival at the point of injury as dictated by the 9-line evacuation request and the MIST reports. It is desirable to have at least two medics on the evacuation platform when blood is being given. (Theater Trauma Conference – RC-S and SW MEDEVAC Medical Director and EM Physician)

80. USAF Pararescue personnel conducting CASEVAC noted that they do not give plasma because it takes too long to resupply. (Bastion Role 1 – USAF Pararescue, BAF Role 1 – USAF Pararescue) As a follow-up, this issue was discussed with COL (Ret) John Holcomb, now the Chief of Trauma at Memorial Hermann Hospital in Texas. Memorial Hermann gives both blood and plasma pre-hospital when indicated on their helicopter ambulance service. Dr. Holcomb's input: Thawing the plasma is a real time sink. We have now had thawed plasma on 4 helicopters for 14 months, but switched to liquid plasma last month. Thawed plasma is good for 5 days. Liquid plasma (never frozen) is good for 26 days. Our service decided not to use the Golden Hour Box, but they use something similar. If plasma is not used, and the storage temperature is controlled, we put the plasma back into the hospital stock at day 3 for thawed or day 15 for liquid so we can avoid wasting the product.

81. Given current short transport times, few casualties on U.S. evacuation platforms receive more than one unit of blood product during TACEVAC flights, although the UK MERT platform often transfuses larger volumes of pre-hospital blood and plasma. If transport times increase, or larger platforms allow more medical personnel, it may become possible to transfuse more units of blood products and then plasma may become more important. There are additional issues associated with getting liquid plasma to the combat zone. Would you get it from the U.S.? (average age for PRBC transfused in mass transfusion is 23 days) Would you pheresis it in theater? (JTTS Deployed Director)

82. Salerno FOB National Guard DUSTOFF unit has trained paramedics who are also critical care flight paramedics in the civilian sector. Bagram Airfield Active Duty DUSTOFF unit (Shadow DUSTOFF) is promoting paramedic certification as an internal unit initiative.

83. The USAR 11th Aviation Regiment is developing a partnership with Memorial Hermann Hospital and "Life Flight" for trauma center rotations to support the pre-deployment and sustainment training of their medical personnel. This effort should be supported, expanded, and used as a model of excellence. (JTS Trauma Care Delivery Director)

84. There are two crewmembers in the back of the aircraft on Shadow DUSTOFF missions – the flight medic and the crew chief. The crew chief routinely assists in casualty care and should be trained at least to the EMT-B level. Currently, an Emergency Critical Care Nurse (ECCN) will frequently augment flights. (JTTS Deployed Director) Both should be trained in TCCC as well. (CoTCCC Chairman)

85. ECCNs bring a higher level of medical capability (advanced airway management, mechanical ventilation, hemodynamic and vasoactive medication management, advanced assessment skills) as they augment flights with medics during POI missions, in addition to transfers of critically ill and injured between MTFs. (JTS Enroute Critical Care Director)

86. ECCNs are currently non-rated crewmembers. As they are not assigned to an aviation position paragraph and line number, they are managed differently by each MEDEVAC unit in

theater. They are not authorized flight pay or flight wings. Some units do not allow ECCNs to officially track flight hours or complete readiness level progression because they are not official crewmembers. (JTS Enroute Critical Care Director)

87. ECCNs are currently Medical Brigade assets. However, they do not deploy at the same time as the medical brigade or MEDEVAC units. This causes issues and variability with training, awards, team-building, trust, and consistency in mission. (JTS Enroute Critical Care Director)

88. There are meetings with USA MEDEVAC personnel and USAF CASEVAC personnel every other Friday. Both evacuation systems are capable of giving blood enroute, but neither is doing so currently in the KAF system due to administrative issues. Both systems are using and like ketamine. There have been no known adverse effects from pre-hospital ketamine in the KAF AO. (KAF Role III – Intensivist)

89. USFOR-A is currently acting to develop and refine an advanced medical evacuation capability for US forces. (USFOR-A SG) Two pending papers will show that this advanced evacuation capability reduces mortality in severely injured combat casualties. (CoTCCC Chairman)

90. MEDEVAC unit personnel recommend that designated MEDEVAC (DUSTOFF) aircraft with red crosses be sustained in order to preserve a dedicated platform for this mission. (Shadow DUSTOFF) However, CASEVAC unit personnel note limitations of MEDEVAC aircraft (red crosses, lack of weapons) as well as limitations in MEDEVAC crew training (tactics and weapons training). (UK MERT CASEVAC, USAF CASEVAC) A dedicated platform capability should not solely dictate the mission requirement; the mission requirement should dictate both a dedicated platform and a dedicated medical capability. The goal is to decrease time to damage control resuscitation and damage control surgery. (JTS Trauma Care Delivery Director)

91. Patient Evacuation Control Cell (PECC) intelligent tasking is occurring in the Afghanistan Southwest Regional Command. Experienced emergency medicine and intensive care unit nurses are being assigned and utilized at the PECC. Clinical and tactical concerns are considered during tasking, and the most appropriate tactical evacuation asset is employed. Although strong clinical experience is vital, intelligent tasking algorithms and a matrix should be developed and refined.

92. A better defined list of injury severity and recommended evacuation categories would be very useful. Tactical factors should be considered in the evacuation process, such as a Soldier who is part of a foot patrol who suffers a badly sprained ankle. (KAF Role III – PECC Nurse)

93. The PECC may upgrade an evacuation if needed, but they do not downgrade the evacuation categories submitted. (KAF Role III – PECC Nurse)

94. With the drawdown of forces, it may prove difficult to maintain current evacuation times. Additionally, it may prove challenging for Afghan forces to provide organic evacuation. The challenge may be to keep the percentage of preventable deaths at current levels.

95. For the USAF Pedro & Guardian Angel Team, casualty evacuation is normally a third priority behind CSAR for US forces and CSAR for Coalition forces. Pedro has increased tactical capability secondary to Forward-Looking Infrared (FLIR) imaging system and weapon systems. MEDEVAC platforms with Red Crosses versus training with weapons? Red Crosses may serve to dedicate a platform for evacuation; however, do modern mission requirements dictate

armament? A “paradigm shift” is needed for Army tactical evacuation. (Bastion Role I – USAF Wing Commander)

96. For USAF units conducting CASEVAC, Category A and B missions are never refused. (Bastion Role I – USAF Wing Commander)

97. UK MERT CASEVAC is often used for CAT A or multiple casualties; the MIST report is often unclear about the need for blood; MERT flies with 4 units of thawed plasma and 4 units of PRBCs and turns units back to blood bank if not used; the platform carries D oxygen cylinders and has a maximum capacity of 8 stretcher casualties. (Bastion Role I – UK MERT)

98. The UK MERT CASEVAC takes the Emergency Department to the Point of Injury. There is a publication pending in Annals of Surgery that studies the effect of the MERT on casualty survival; for casualties with an Injury Severity Score (ISS) of 15-50, mortality in casualties evacuated by the MERT was 12.2% as compared to 18.2% on the non-MERT platform. It is unclear at present which aspect of the advanced capabilities of the MERT is most important. (Theater Trauma Conference – Bastion Role III US Anesthesiologist speaking on behalf of UK Col Rob Russell)

99. The US is currently developing an advanced evacuation capability platform that will incorporate many features of the MERT model. The capability is expected to be operating soon. (Theater Trauma Conference – BG Van Coots, USFOR-A Surgeon)

100. The USAF Pedro & Guardian Angel Team is the casualty evacuation method of choice when: High threat levels are present; the landing zone is small; or a hoist is needed for evacuations from mountain settings (Bastion Role I – UK MERT)

101. The USAF Pedro and Guardian Angel Team’s primary mission is CSAR which is an offensive mission, and the secondary mission is CASEVAC which is a defensive mission. Overall capability can be reduced to three capabilities working in harmony: 1) medic and medical capability, 2) aircraft platform capability, 3) pilot and crew capability. Tactics and weapons training is essential for Role I personnel. (BAF Role I – USAF Pedro Pilots)

102. Casualty Evacuation is not the primary USAF Pedro and Guardian Angel Team’s mission. This mission was assigned to USAF rescue units to help achieve compliance with the Secretary of Defense’s mandated 60 min evacuation time limit. Coverage is not complete in Afghanistan even with USAF support. Operations in areas not covered by the 60-minute evacuation time rings require 4-star approval. (BAF Role I – USAF Pedro Pilots)

103. Reported evacuation times are from the time that the approved 9-line evacuation request is received by the evacuation unit until the aircraft arrives at the medical treatment facility. The average time to launch after the 9-line is received is presently 8-15 minutes. (BAF Role I – 1st Infantry Division) The time intervals from wounding until the 9-line is sent and the time required to approve the evacuation mission are not tracked. (BAF Role I – Shadow DUSTOFF) The time interval from wounding until arrival at the medical treatment facility may therefore be somewhat longer than reported evacuation times. Launch preparations routinely begin before the mission is approved.

104. Medical personnel must work with line commanders in planning for tactical evacuation. All theaters will not be as mature as Afghanistan is at present and evacuation times and circumstances may be much more challenging than seen at present. Knowledge of flight rules

for evacuation platforms and contingency planning for non-permissive environments is critical. Delays of hours to days in evacuation were seen in Afghanistan and Iraq early in these wars and contingency evacuation plans included donkeys and other unconventional platforms.

Personnel

105. Combat medics serving at Role I are generally very familiar with TCCC principles. This is not reliably true for physicians, physician assistants, and nurses, since there is no DoD-wide requirement for them to receive this training. (BAF Role I – Combined Joint Special Operations Task Force)

106. Even Role I combat medical and non-medical personnel who are familiar with TCCC techniques and equipment may not receive up-to-date TCCC training and equipping prior to deployment. (Role I – 3rd Infantry Division, 1st Infantry Division, NSW, USMC/USN)

107. The current ARFORGEN cycle is not optimal for preparing medics for combat deployment. There is too much turnover and new medic backfills will arrive just prior to deployment. It is not solely about medical skills. These new medics must integrate medical skills into unit TTPs and place in context of the mission in order to optimize performance and provide for a functional casualty response system. (Role I – 1st Cavalry Division, 1st Infantry Division, 3rd Infantry Division, 173rd ABCT)

108. Many physicians and physician assistants have limited training and experience in trauma care, especially pre-hospital trauma care. TCCC practices, interventions, and medications (fentanyl lozenges, ketamine, TXA, Hextend) are unfamiliar and/or seldom used by these providers. If they are not familiar with TCCC medications and technology, then they will not allow their enlisted medics to utilize them either. This is the primary reason we continue to see NS and LR being used for battlefield trauma resuscitation instead of Hextend. (Salerno Role I – 101st Airborne Division (AASLT) Physician Assistant)

109. There is no assurance that AF physicians will receive TCCC training. It is considered "elective" training even for deploying physicians and they are often not able to break away from clinic schedules to obtain TCCC training. Physicians deploying in support of combat operations need to know TCCC and to have trauma center rotations. (BAF Role I – USAF Senior PJ)

110. "Physicians don't know battlefield trauma care." (BAF Role I – USAF Senior PJ)

111. Senior medical leaders cannot force individual physicians to provide medical care that they do not agree with. (KAF Role I – 3rd Infantry Division) This underscores the need for physicians to be trained in TCCC and to be familiar with the evidence base for recommended TCCC interventions. (CoTCCC Chairman)

112. Many combatant unit physicians and physician assistants are not conducting combat missions with their units. Without this experience, it is difficult to understand the environment, ascertain requirements, and advance needed pre-hospital casualty care innovation and initiatives. (JTS Trauma Care Delivery Director)

113. Division headquarters are assuming regional commands in theater which are responsible for unit personnel from other divisions. Thus, one division surgeon is relying on pre-deployment training and equipping of medical and non-medical personnel as provided by another division

surgeon who is not invested downrange. Priority for medical training varies between divisions and between commanders at all levels. (Role I – 1st Infantry Division, 3rd Infantry Division)

114. Medics are currently the pre-hospital subject matter experts and center of gravity. Senior medics are the medical continuity for pre-hospital casualty response systems. (Role I – 75th Ranger Regiment) Army physician assistants used to share this role, but changes in their pathway over the past two decades have resulted in current variability for pre-hospital expertise. (JTS Trauma Care Delivery Director)

115. Medics establish trust with combatant unit leaders at the squad and team level where casualties occur. Medics also establish trust with individual Soldiers, who then become combatant unit leaders. (Role I – 75th Ranger Regiment)

116. Medics should have input into medical programs that affect them. Medics believe in and are passionate about their program. However, who is the responsible leader and decision-maker that provides a “voice” for the medic and for pre-hospital casualty response systems at higher levels? (Role I – 75th Ranger Regiment)

117. Medics and first responders must be empowered and supported. They desire the right tools needed to save lives and successfully complete the mission. Transient pre-hospital medical leaders restrict scope of practice, training, and equipment to the point that medics and first responders cannot fully care for their casualties. (Role I – 75th Ranger Regiment)

118. Global reductions in medic bonuses cause an exodus of combat-seasoned and experienced pre-hospital medics. Medics should be valued for their skills, knowledge, and abilities. Retention efforts should be weighted toward medics with pre-hospital combat experience. (Role I – 75th Ranger Regiment Combatant Leader)

119. Medics desire a pathway for accredited education and certification, college credit, autonomy, advancement, and compensation. Their pathway is suppressed by transient pre-hospital medical leaders and a system that does not consistently reward or value advanced pre-hospital technical capability. (Role I – 1st Infantry Division, 3rd Infantry Division, 101st Airborne Division (AASLT), 173rd ABCT, 75th Ranger Regiment)

120. Professionalize the force, and flatten the organization. Monies provide a nominal advantage to special operations units; whereas assessment and selection criteria provide a significant advantage to these units. Review and refine assessment and selection criteria for the services as a whole – especially as deliberate downsizing occurs for the military. Decrease middle management and increase individual autonomy and productivity. (Role I – 75th Ranger Regiment Combatant Leader)

121. It's good for medical officers to go out on operations with the unit. That's how the medical officers earn the trust of the Rangers in the unit. We had one medical officer who crawled out into the open to save a wounded Ranger while we were still killing people. (Role I – 75th Ranger Regiment Combatant Commander)

122. SEAL medics desire technical career progression within SOF community to include the creation of a SEAL medic warrant officer. (Tarin Kowt Role I – NSW)

123. Physicians and physician assistants are assigned to support units that then provide medical support to SEAL teams, rather than being integrated into the SEAL team structure.

They do not routinely conduct missions with their medics. They are not reliably trained in TCCC at present. (Tarin Kowt Role I – NSW)

124. For Australian forces, primary care physicians (e.g. Family Medicine) are maintained on active duty. They provide medical care, oversight, and medical leadership for Role I. Physician specialists are maintained in the reserves. They have no physician assistants, but they do have nurse practitioners. (Tarin Kowt Role I – Australian Forces Physician)

125. Australian force Role I medical hierarchy: 1) Buddy Aid, 2) Combat First Aider (CFA), 3) medic, 4) physician. All Australian forces are trained on tourniquet application. (Tarin Kowt Role 1 – Australian Forces)

126. The Australian Army School of Health provides medics with a diploma for “Paramedical Science.” (Tarin Kowt Role I – Australian Forces)

127. UK forces have combat medical technicians (CMTs) and team medics. CMTs are medics by occupation and team medics are similar to a US combat lifesaver. The basic CMT course provides a Class II medic. The Class I course provides a Class I medic. The Battlefield Advanced Trauma Life Support (BATLS) Course and the Pre-hospital Emergency Course (PEC) is provided. Paramedic-level advancement was recently initiated for the top performing CMTs.

128. UK physicians go out with Role I to patrol base and conduct combat missions as required. (Bastion Role I – UK Forces)

129. UK Close Support Squadron medics are imbedded into line units. For pre-hospital documentation, line personnel serve as the scribe. Medics train the line personnel, and all function as a “casualty response team.” Using this practice, UK medics have successfully completed field medical cards on nearly all casualties. (Bastion Role I – UK Forces)

130. A MERT paramedic is a registered independent medical provider who receives a bachelor’s degree in paramedical science and is considered an Emergency Care Practitioner (ECP). All is regulated through the Health Care Professions Counsel and the National Health Service (NHS) who provides Emergency Clinical Guidelines. (Bastion Role I – UK MERT Paramedic)

131. The Joint Royal Colleges Ambulance Liaison Committee Guideline Development Group (JRCALC-GDG) develops and reviews national clinical practice guidelines for NHS paramedics although the principles are applicable to all pre-hospital clinicians. Guidelines can be found at the following URL: <http://www.jrcalc.org.uk/guidelines.html>. Although paramedics must adhere to these guidelines, an emergency medicine physician has the ability to authorize and expand scope of practice as required. (Bastion Role I – UK MERT)

132. Medical directors for PJs are sometimes initial entry general medical officer (GMO) flight surgeons with minimal clinical and practical experience. The PJ Medical Oversight and Advisory Board (MOAB) and PJ Handbook assist by providing clinical guidelines. However, sometimes the unit flight surgeon may impose restrictions on scope of practice. Sometimes this is overridden as was the case with flight surgeons being directed to conduct training for blood product administration program. (Bastion Role I – USAF Senior PJ)

133. Should we recreate and redevelop a medical warrant officer program? The Interservice Physician Assistant Program selection should elevate the importance of combat experience as a selection factor for the program. (Bastion Role I – USMC/USN)

134. Significant prior combat medic experience should be a major selection factor for physician assistant school. (BAF Role I – CJSOTF, 1st Cavalry Division, 1st Infantry Division, 173rd ABCT; Role I – 75th Ranger Regiment)

135. “As a SEAL platoon chief - I have incredible operational autonomy. With respect to medical issues, I have essentially no autonomy when it comes to which meds I give and can order.” (Tarin Kowt Role I – NSW Platoon Chief)

136. SEALs no longer have SEAL operators who are designated as corpsmen; all trident wearers are designated as “SEAL Operator.” SEALs who have attended the Special Operations Combat Medic (SOCM) Course are denoted informally as “SEAL SOCM Medics.” (Tarin Kowt Role I – NSW) The impact on medical readiness to perform combat casualty care resulting from this fundamental change in enlisted personnel designation has not been evaluated.

137. Every deploying SEAL squadron should have a physician or a physician assistant with them. That person should have had an NSW medical provider orientation and should attend TCMC or TCCC orientation - not walk in the situation cold. (Tarin Kowt Role I – NSW)

138. There are currently no medical officers or physician assistants assigned to individual SEAL teams or squadrons. They are assigned to NSW Logistic Groups. There are non-SEAL Independent Duty Corpsman assigned to the SEAL teams who may have no background in NSW and who may disempower SEAL SOCM Medics from the skills that they are taught and required to have by USSOCOM directive. (Tarin Kowt Role I – NSW)

139. NSW is the only SOF organization that deploys team-sized units without a PA or physician. MARSOC deploys company-sized elements with SOIDCs. (Tarin Kowt Role I – NSW)

140. Some NSW units have begun using USMC Special Operations IDCs (HM 8403s) or USAF PJs for battlefield trauma care because of the difficulty of maintaining both SEAL combatant and medical skills. (Tarin Kowt Role I – NSW)

141. I have been through the Special Forces 18-D school, but NSW took away all of my medical capabilities because now I am now designated as a SEAL Operator. On a recent deployment to Africa, we had an evacuation time of 4 hours, but no physician, no PA, and no medications for the SEAL medics. There should be a clearly outlined pathway for medical skills progression in NSW from SEAL SOCM Medic to 18D to PA and this medical progression should be valued and encouraged by the SEAL community. We MUST have better deployed medical support for SEAL units when they are deployed in isolated settings – either an 18D trained provider, a PA, or an Emergency Medicine or Family Practice physician. These individuals must be familiar with SEAL and CJSOTF operations. (Tarin Kowt Role I – NSW Combatant Leader)

142. NSW and BUMED should consider creating a SOF corpsman who can function as a medic in both NSW and MARSOC. They could then stop sending SEALs to SOCM if they will not be allowed to function as medics when they graduate. (Tarin Kowt NSW Role 1 – Senior Medic)

143. I'm pretty sure that if a SEAL platoon chief was a sniper before he became a platoon chief, he would be allowed to function as a sniper if he chose to do so. (Tarin Kowt Role 1 – Senior Medic)

144. The PJ community is hovering at approximately 50% manning. (BAF Role I – USAF Senior PJ)

145. A reserve physician who works for the Air Combat Command (ACC) has recently assumed the leadership role for PJ medical issues. He has been designated by the USAF SG as the PJ consultant. He is dedicated, very involved, and has been a key element in achieving a very high level of PJ medical readiness. (Bastion Role I – USAF Senior PJ)

146. USMC battalions need approximately 65 HMs to deploy. There are usually 30-40 permanently assigned. Approximately 25 are pulled from Naval hospitals to deploy with the battalion. (Bastion Role I – USMC/USN physician)

147. The large majority of Marine Recon and MARSOC HMs are Special Operations IDCs rather than SOCMs or 8404s (basic USMC support corpsman). (Bastion Role I – USMC corpsmen)

Training

148. Medical training and readiness should be measured before deployments and considered a go or no go item with Commander attention. (Theater Trauma Conference)

149. Army physicians and 68W medics, SFC and above, assigned to line units attend the Tactical Combat Medical Care (TCMC) course, where they are taught TCCC prior to deployment per Forces Command directive. (BAF Role I – 1st Infantry Division)

150. Army medics E-6 and below attend the Brigade Combat Trauma Team Training (BCT3) course per Forces Command Directive. TCCC is part of BCT3. (BAF Role I – 1st Infantry Division)

151. Military physicians, physician assistants, and nurses deployed to MTFs in CJOA-A do NOT always get trained in TCCC. (BAF Role III; Salerno Role II; Kandahar Role III; Tarin Kowt Role II; Bastion Role III) These providers would therefore not necessarily understand the approach and the rationale for the pre-hospital care provided by combat medical personnel.

152. Navy physicians assigned to Marine line units have no requirement to be trained in TCCC. (Bastion Role I – 1 Marine Expeditionary Force; Bastion Role I – Combat Logistics Regiment 15) These providers would therefore not necessarily understand the approach and the rationale for the pre-hospital care provided by their corpsmen.

153. It does no good to train medics, corpsmen, and PJs in TCCC if their Division, Brigade, and Battalion physicians and physician assistants do not allow them to perform the interventions recommended in TCCC. This underscores the importance of training the physicians and physician assistants in TCCC. (Role I – Physician Assistant)

154. The 75th Ranger Regiment Regimental Command Inspection (RCI) program tracks and evaluates 100% Ranger First Responder achievement. This effort is not “pencil whipped.” (Role I – 75th Ranger Regiment Combatant Leader)

155. The biggest difference in combat casualty care in the 75th Ranger Regiment has been the Ranger First Responder course. Conventional forces do not do anything like that. All of my platoon members are assistant medics. (Role I – 75th Ranger Regiment medic)

156. When we have a day off – we do medical training. (Role I – 75th Ranger Regiment Combatant Leader)

157. Casualty response training for first responders and combatant leaders is often not incorporated into unit battle drills. (BAF Role I – 1st Infantry Division) This is an essential component of battlefield trauma care. (Role I – 75th Ranger Regiment)

158. Provide a structure and foundation for casualty response systems and trauma care training. Culture and strategy follow structure. Prioritize resources and training based on structure. Master the basics. Reinforce the basics. Achieve confidence through competence on the basics. Do not just train the basics, condition the basics through repetition. Akin to marksmanship, physical training, and small unit tactics, first responders must become the masters of the basics of pre-hospital casualty response. Combatant NCOs provide first responder continuity for casualty response systems. (Role I – 75th Ranger Regiment)

159. Casualty response systems must be tailored to the unit and the mission. One size does not fit all; however, the framework for a casualty response system is not being evenly applied. Initial medical training programs must be accompanied by sustainment medical training programs in order to achieve enduring effects. Initial medical training programs are centralized and easier to standardize and implement. Sustainment medical training programs are decentralized and more difficult to standardize and implement evenly across the military. (Role I – 75th Ranger Regiment)

160. Some units may only be training first responders in TCCC to a level of “familiarization” versus conditioning first responders to a level of “proficiency” or a level of “mastery”. Casualty response training should be repetitious hands-on training commensurate to marksmanship, physical training, and small unit tactics. Unit casualty response rehearsals should be conducted routinely. A medical equipment pre-combat check (PCC) and pre-combat inspection (PCI) should be conducted prior to every mission. (Role I – 75th Ranger Regiment)

161. Basic training units should have a standard TCCC POI that trains first responders to proficiency. Training can be conducted to a level of familiarization, proficiency, or mastery. Training to a level of familiarization will not save lives under the stress of combat. (BAF Role I – 1st Cavalry Division)

162. Best practices and procedures should be cross-leveled and standardized between all military medical simulation training centers (MSTCs), as currently too much variability exists between sites. MSTCs should receive central certification. MSTCs should serve as a TCCC training materiel and equipment distribution site. MSTC trainers need to be subject matter experts, regardless of military versus civilian status, and they must train to a standard not to a time. (BAF Role I – 1st Cavalry Division, 1st Infantry Division, 173rd ABCT)

163. Senior ground medics expressed concerns for the current inequity of opportunity for paramedic training when compared to flight medics and civilian counterparts. A ceiling exists that limits the technical education and growth of ground medics. (Role I – 1st Infantry Division, 3rd Infantry Division, 101st Airborne Division (AASLT), 173rd ABCT)

164. If combat casualty care is a training priority and a requirement, combatant commanders need to formally place all levels of casualty response training on short and long term training calendars. (Role I – 1st Infantry Division, 3rd Infantry Division, 101st Airborne Division (AASLT), 173rd ABCT)

165. A medical rapid fielding initiative should include subject matter experts to provide “train the trainer” instruction. (Role I – 3rd Infantry Division)

166. Civilian contracted TCCC and tactical first responder courses vary in quality. They provide either great training or a means to check the block for training. Who inspects, certifies, and ensures quality control of these programs? (Tarin Kowt Role I – NSW)

167. Oftentimes training occurs during deployment, rather than pre-deployment. (Tarin Kowt Role I – Australian Forces)

168. All UK forces are taught Battlefield First Aid (BFA), initially and refresher once a year. (Bastion Role I – UK Forces)

169. Live tissue training (LTT) is paramount and saves lives. (Role I – USA, USAF, USMC, USN)

170. Field Medical Training Battalion (FMTB) course is 8 weeks with combat trauma management as a 2 week portion taught toward the end of the course. All elements include LTT in pre-deployment training (PDT). LTT is essential – most currently use swine model. FMTB approves curriculum for LTT vendor courses. All contracted and based on TCCC; however, companies vary on how skills are taught (e.g. “high and tight” tourniquets, improper location for needle decompression). Consider cost and benefit of contract versus organically provided training. (Bastion Role I – USMC/USN)

171. Marine Corps and BUMED directives mandate TCCC training for HMs but not physicians. Combat Trauma Training should be a theater requirement. (Bastion Role I – USMC/USN)

172. Physicians typically go to a combat trauma course put on by a private contractor that includes LTT. USMC medical officers get the same course as corpsmen and riflemen. The course is 1 day of lectures and 1 day of application (LTT). It is billed as a Combat Lifesaver course and incorporates TCCC, although it may not have the latest updates to TCCC. (Bastion Role I – USMC physician)

173. The Combat Casualty Care Course (C4) conducted for medical officers is hit and miss. All interns are supposed to get the C4 course at the Defense Medical Readiness Training Institute (DMRTI). This is a 10-day course, of which 3 days is TCCC. Not all interns actually attend this training. Additionally, this is a one-time only initial training – no sustainment training is provided. Are we training military medical officers and employing them in the right manner or are we stuck in an old paradigm? As physicians receive initial and sustainment training in ATLS, there should be a universal requirement for military physicians to receive initial and sustainment training in combat casualty care. (Bastion Role I – USMC/USN)

174. It is a MEF requirement for all medical officers to go to the Naval Trauma Training Center prior to deployment. The training is good but the trauma is different from that seen in theater. Two days of TCCC is taught as part of the NTTC course. (Bastion Role I – USMC physician)

175. Medical officers assigned to USMC units attend the 2-week Field Medical Service Officer (FMSO) Course at one of the two FMTBs. This course provides an introduction to Marine Corps medical support structure and function, Marine combat operations, and the basics of field medical care. Basic TCCC concepts are covered but this portion of the course is not formalized and there is no certification provided. (Bastion Role I – USMC physician)

176. Stress training is essential. Trauma center rotations (TCRs) and Navy Trauma Training Center (NTTC) are both desirable. The Navy Medical Education and Training Command should require and provide both TCR and LTT – not either/or, but both. Cadaver lab is not the same as LTT – it does not provide the same stress and realistic training. (Bastion Role I – USMC/USN)

177. There is an uneven application and implementation of pre-hospital and TCCC protocols within and between services. There is also a significant delay of data and protocol integration at the service schoolhouses. (Bastion Role I – USMC/USN)

178. The content of some TCCC courses taught to U.S. military personnel does not accurately reflect the recommendations made by the Committee on TCCC as published in the PHTLS Manual and posted on the PHTLS and Military Health System web sites. (Role 1 – USMC/USN)

179. There was unanimous agreement that LTT is very helpful in preparing corpsmen to manage combat casualties. There was a recommendation that the USMC, USSOCOM, and USCENCOM do a joint letter to address this issue. There is a need to optimize the use of LTT models to teach the required procedures and there should be more objective metrics for LTT. (Bastion Role I – USMC/USN physicians and corpsmen)

180. There is currently no requirement to make HMs EMT-B qualified. Naval hospitals want corpsmen to have this certification so they can use them on ambulance transports. The Navy tried to incorporate this requirement, but it was resource intensive. EMT-B training was noted to be not really helpful for managing combat trauma. (Bastion Role I – USMC/USN corpsmen)

181. Special Forces medics reliably get updated TCCC training and equipment as a result of the Special Operations Medical Skills Sustainment Course; and both medical and non-medical Special Forces personnel receive TCCC training prior to combat deployment during Pre-Mission Training (PMT). (BAF Role I – CJSOTF)

182. Physicians assigned to Special Forces units as Battalion Surgeons do NOT reliably get TCCC training before deploying to combat theaters. (BAF Role I - CJSOTF)

183. Battlefield trauma training must be a reportable item and receive command attention. (KAF Role I – 3rd Infantry Division)

184. Combat medics MUST have Live Tissue Training. (KAF Role I – 3rd Infantry Division)

185. Combatant units would like to get an update package whenever changes are made to TCCC. (KAF Role I – 3rd Infantry Division)

186. The 3rd ID is working to increase the skill level of their flight medics to paramedics. (KAF Role I – 3rd Infantry Division)

187. All Medical Officers in the 3rd ID went to TCMC, and all medics went to either BCT3 or TCMC. However, units from other divisions are deployed under our command and may not have the same strict training requirement. (KAF Role I – 3rd Infantry Division)

188. All SEALs receive TCCC training as part of the SEAL Qualification Training course and again as part of Tactical First Responder (TFR) training in preparation for deployment. Physicians assigned to NSW units do not necessarily get formal TCCC training. (Tarin Kowt Role I – NSW) This creates the remarkable potential for NSW physicians to know less about battlefield trauma care than non-medical SEAL operators.

189. Tactical First Responder (TFR) training for SEALs is a 3-day course. It is contractor-run and varies in quality depending on the contractor chosen. It does not necessarily include the latest updates in TCCC. TCCC training should be the responsibility of the UNIT senior combat medical leader. Casualty response drills that include TCCC are part of this training. Live tissue training is excellent and is an important part of this course, but needs to be done in the context of TCCC principles and should be a culminating event. TFR should be done at the start of platoon pre-deployment training. (Tarin Kowt Role I – NSW)

190. The Special Operations Combat Medic (SOCM) course is now almost 8 months long and teaches both TCCC and the USSOCOM Tactical Medical Emergency Protocols. (Tarin Kowt Role I – NSW) The expanded SOCM course may be the clinical equivalent of Navy IDC school with respect to trauma care and emergency medicine in deployed environments. (Tarin Kowt Role 1 – NSW Senior Medic)

191. SEAL medics had very strongly positive feedback about SOCMMSC training. The quality of instruction is excellent and it provides re-certification and trauma refresher training all at once. (Tarin Kowt Role I – NSW)

192. SEAL medics recommended that a trauma rotation be available for all SEAL SOCM Medics. There is currently a rotation at Spirit of Charity Trauma Center in New Orleans that is available for some units, but not all. (Tarin Kowt Role I – NSW)

193. Trauma Center rotations are available when requested by SOF units for their medics and can be coordinated through their chain of command. (Tarin Kowt Role 1 – NSW Senior Medic)

194. LTT should be optimized to train the best life-saving skills. (Tarin Kowt Role I – NSW Combatant Leader) Both USSOCOM and Headquarters USMC have issued letters on how to optimize this training. (CoTCCC Chairman)

195. NSW physicians get relatively more training in submarine and dive medicine during Undersea Medical Officer (UMO) training, and relatively less training in SEAL operations, both land warfare and diving. The SEAL support portion of UMO training needs to be expanded significantly and include field experience in NSW operations. This training should also include an overview of the entire scope of USSOCOM component organizations and their missions, an understanding of deployed SOF missions, and deployed SOF task force structure/function.

There should also be TCCC, LTT, and selected SOCMSSC items in the course. (Tarin Kowt Role I – NSW)

196. We can't send a PJ to war unless all of his certifications are current; otherwise how would we assure skills maintenance? We need an EMT-M (Military). (Bastion Role I – USAF CRO)

197. LTT has saved many lives. It will be a travesty if we lose it. LTT should include tactical scenarios. It is taught by contract vendors and there is variation in the quality of the courses. (Bastion Role I – USAF CRO and Senior PJ)

198. PJs have a robust internal network for following new developments in TCCC and do not necessarily need a TCCC Transition Initiative provided by an outside organization. (Bastion Role I – USAF Senior PJ)

199. PJs need hands-on trauma experience at trauma centers as well as paramedic and other required recertifications. PJs train using LTT at least every 2 years. This training is in addition to current PJ deployment frequency – every other 3 month period. (BAF Role I – USAF Senior PJ)

200. Many potential military and civilian first responders routinely play popular combat video games (e.g. Halo, Call of Duty, Gears of War). Partner with the makers of these games and integrate accurate first responder treatment protocols for casualties in the game, based on injuries and injury requirements. (JTS Trauma Care Delivery Director)

Equipment, Medications, Research, Technology

201. Army physicians and medics are well-informed about the basic tenets of TCCC techniques and technology but were found to lack recommended equipment items and medications – no TCCC cards, no OTFC, no ketamine. (BAF Role I – 1st Infantry Division; Salerno Role I – 101st Airborne Division (AASLT))

202. The impact of pre-hospital opioid analgesia on casualty outcomes has not been well-documented. (CoTCCC Chairman)

203. Special Forces, Rangers, 160th SOAR, and Pararescue units are now carrying TXA. SEAL units do not carry TXA. (Tarin Kowt Role I – NSW) PJs have had TXA since the TCCC recommendation was made. (Bastion Role I – USAF Senior PJ)

204. There is a moral obligation to treat pain. Effective analgesia also helps to decrease the risk of PTSD. Opioids are overused at present. Ketamine is not really a new option, but there is relatively little ketamine use in theater at present. The use ratio of ketamine with opioids is about 1:25. This ratio should approximate 1:1. One to three mg of midazolam is useful for ketamine side-effects. Ketamine should not be given IV push, but injected over 1 minute. (Theater Trauma Conference – V Corps Command Surgeon)

205. TF Med A theater clinical operations has been tasked to obtain single dose vials of ketamine (currently only available in very concentrated multi dose vials) and a ketamine autoinjector. (Theater Trauma Conference – TF Med A Commander)

206. Enroute care issues in theater at present include the need to develop a better physiologic parameter to monitor as a sign of impending shock. Blood pressure is not a good marker for

shock in that it is a late sign. Current research at the USAISR is focusing on cardiovascular reserve index as determined by computerized analysis of the arterial pulse wave character. Also, there is a need to expedite fielding of the 731 ventilators. The ventilator's calibration device is currently awaiting an FDA determination, but could be calibrated by forward positioned company representatives. Maintenance training for biomedical equipment technicians is also required prior to fielding. (Theater Trauma Conference – BAF Role III Trauma Surgeon)

207. Evacuation in conventional units may be delayed beyond the 3-hour cut-off for TXA use in casualties at risk for death from hemorrhage. Conventional evacuation units should have access to TXA. Prophylactic TXA should be considered. (Theater Trauma Conference – V Corps Command Surgeon)

208. The mission of the FDA is to ensure that drugs are safe and effective. The company bringing a drug to market must select the indication for the drug. Prospective, randomized trials are designed to demonstrate that the drug works for that indication. The company bears the expense for this testing. Once the drug is approved for one indication, physicians can use it for other indications. Drug companies therefore typically have little financial incentive to obtain additional labeled indications. This is especially true for military uses, since wars are hopefully the exception rather than the rule and do not provide a primary market for a medication. Off-label use of medications is widespread and well-accepted in medical practice. The prospective, randomized trials needed for FDA approval are not possible on the battlefield. Civilian trauma trials cannot precisely duplicate battlefield trauma and medications are not labeled specifically for battlefield trauma. Therefore, most if not all uses of all medications on the battlefield are off-label. The FDA and the military should acknowledge this as acceptable as long as such use is supported by the weight of the available clinical evidence. (CoTCCC Chairman)

209. Medics report that the Combat Ready Clamp (CRoC) is too bulky and heavy to carry on missions and takes too much time to assemble and apply. (BAF Role I – 1st Infantry Division, Shadow DUSTOFF; Role I – 75th Ranger Regiment) The optimal fielding of this device might be in a pre-assembled configuration and carried on tactical vehicles and evacuation aircraft. (CoTCCC Chairman)

210. There should be a medical rapid fielding capability for potentially lifesaving new TCCC techniques and technology to include a transition team visit to deployed forces, initial supply, training, and testing of knowledge. (BAF Role I – 1st Infantry Division; 3rd Infantry Division; Shadow DUSTOFF; CJSOTF; Role I – 75th Ranger Regiment; Tarin Kowt Role I – NSW; Bastion Role I – USMC/USN)

211. 68W medics in the ground combat units interviewed are trained on and carrying the King LT and may have occasion to use them in Tactical Field Care (TFC).

212. The new Impact 731 ventilator needs to be expedited into theater. The older Impact 754 ventilator units are not performing well and frequently shut down while being used. (JTTS Deployed Director)

213. Medic participation in the Navy Medical Lessons Learned Center (NMLLC) TCCC equipment evaluation should be encouraged for all services and units. NMLLC should provide directed updates from this project to CENTCOM and deployed forces as appropriate.

214. Consider developing a NMLLC TCCC equipment evaluation for Role I physicians and physician assistants.

215. Packaging for French freeze dried plasma (FDP) is not optimal for pre-hospital use. USASOC units who carry French FDP modify packaging to accommodate as possible. However, new packaging must be developed. (Role I – 75th Ranger Regiment)

216. For many units, initial issue of medical equipment occurs in theater after deployment, but should occur prior to pre-deployment training.

217. IOs are working. They are placed properly, but approximately 25% come out. The FAST-1 has a slower flow rate than the EZ-IO. Pre-hospital providers appear to prefer humeral IOs. This type of IO has the faster flow rate, but also is the easiest to displace. (KAF Role III)

218. Although preliminary data from the Baltimore CSTARS (Center for the Sustainment and Readiness of Trauma Skills) study denotes IO flow rate to be greatest with humeral method (humeral > tibial > sterna), the humeral IO dislodges easier. (JTTS Deployed Director)

219. Essentially all casualties in the last few months were wearing eye protection. We see eye injuries from “inside the wire” activities such as metal grinding. The eye protection currently used is Revision and Wiley X. Both are ANSI Z87-2 approved and authentic Wiley X units have this approval stamped on the frame. The local bazaar sells fake Wiley X, identified by lack of ANSI Z87-2 stamp on the frame. These fake Wiley X eye pro units do not provide adequate protection and this has led to serious eye injuries. Afghan personnel without eye protection who sustain a facial peppering injury pattern from IEDs have nearly 100% open globe injuries. (KAF Role III – Cornea Specialist)

220. KAF Role I Equipment Notes: wanted Hextend but could not get enough prior to deployment, using NS and LR instead; Medics are not allowed to give IV meds, giving IM morphine; want OTFC but has been hard to get; no ketamine; no parenteral antibiotics; no combat pill packs; no TCCC cards; preferred litter is Fox litter; spine boards are carried in vehicles. (KAF Role I – 3rd Infantry Division)

221. A doctor of pharmacy was attached and deployed with 3rd Infantry Division. This increases flexibility for instituting novel pharmaceutical solutions and training. (e.g. nasal ketamine beta project) (KAF Role I – 3rd Infantry Division)

222. In the absence of a “proven” product that can be standardized, the medic will improvise. This creates variability in care, but also provides innovation. (Tarin Kowt Role I – NSW)

223. BUMED pathway for approval, procurement, and fielding of medical equipment and medications can prove difficult to negotiate. (Tarin Kowt Role I – NSW)

224. Combat First Aiders (CFAs) carry CAT Tourniquet, Quickclot Gauze, NPA, needle for decompression, and Asherman chest seal (ACS). However, they prefer Halo and Hyfin chest seals over ACS. Medics also carry OPA, LMA, and chest tubes. For IV fluids carried – no colloids, only crystalloids (NS, LR). CFAs can also provide IV fluids. For pain management administered – IV morphine and OTFC, no ketamine. A handbook for clinical practice guidelines and protocols is in development. (Tarin Kowt Role I – Australian Forces)

225. Australian Force medics are not issued a medical kit, they buy their own; physicians sign for a “Thomas Pack” at the unit. (Tarin Kowt Role I – Australian Forces)

226. The CROC may apply pressure too distally for many casualties. There is interest in the abdominal aortic tourniquet. The UK places more emphasis than the US on pre-hospital use of pelvic binders in casualties with suspected pelvic fractures (Bastion Role III – UK)

227. The UK medic aid bag is a “Blackhawk” bag which has been the standard since approximately 2010. Strayer Traction Splints are carried on evacuation platforms. Grab bags for ground medic resupply are also placed on tactical evacuation platforms, and contents are modified based on the MIST report and requests from the POI. Some US evacuation units also use this technique. (Bastion Role I – UK medics; Bastion Role I – USAF Pararescue personnel; BAF Role I – USAF Pararescue personnel)

228. The UK IFAK is standardized in design (“roll-out” pouch with black cross), content and location of content (2 x pressure dressing, 2 x CAT tourniquet, 2 x Celox Gauze, 2 x Bolin chest seal, 2 x morphine IM syringe, casualty card), and location worn on body (right hip). Additionally, all carry a CAT tourniquet in the left upper shoulder pocket. The UK Surgeon General dictated that morphine IM be carried by all, and each combatant carries two 10-mg morphine auto-injectors. Standardization expedites critical care. (Bastion Role I – UK medics)

229. UK medic equipment notes: They carry the CAT tourniquet and like it; they carry Celox Gauze and like it; unhappy with Asherman chest seal and have replaced with Bolin; carry 3.25-14ga needles for chest decompression; use sodium lactate to resuscitate casualties in shock and titrate to a normal radial pulse in 250 cc increments; do not currently carry dried plasma; carry both FAST- 1 and EZ-IO and they like FAST-1 better due to ease of insertion; carry and use both pelvic binders and c-collars; use and like very much the Prometheus litter which is made of thin black material, is very lightweight, and easier to use and drag than other litters; use IM Morphine and OTFC, but no IV morphine (several medics interviewed noted that they believed that IM morphine works better than OTFC); they do not have ketamine, antibiotics, or TXA; they do emphasize filling out a point of injury casualty card, although the medics will often have another team member serve as a scribe for this function. (Bastion Role I – UK medics)

230. UK medics carry morphine and OTFC, no ketamine. Medics can only give morphine IM, not IV. Medics have been giving OTFC since 2010. No pre-hospital antibiotics are provided due to the current rapid evacuation times. (Bastion Role I – UK medics)

231. For the most part, the IFAK is standardized across the USMC but there is some inter-unit variability. Marines carry tourniquets, combat gauze, NPA, chest seals, and needles for decompression. They use SOF-T tourniquets. Two tourniquets are carried by all, one in each shoulder pocket. Not carried on leg, as the leg is affected more by blast MOI. (Bastion Role I – USMC/USN)

232. USMC corpsmen equipment notes: All carry King LTs, 8404s also carry Combitubes; all can do surgical airways; SOIDCs can intubate, but not 8404s; the NARP cric tube is too small, prefer H & H cric kit; capnography should be used to confirm airway placement with intubation and cric; 8404s don't have capnography, but SOIDCs often do; all have needles for chest decompression; USMC/USC corpsmen have experience with the Bolin, Asherman, and Halo chest seals; Halos stick best - others stick well if the chest is properly prepped; Recon corpsmen prefer the EZ-IO, especially with mini drill; humeral IOs are difficult, they prefer tibial; 8404s like the FAST-1 because it is easy to do; some 8404 corpsmen carry LR or NS as resuscitation fluid; Recon corpsmen have IV morphine and ketamine, but 8404s have neither; 8404s have 2 x IM morphine and 2 x OTFC 800ug; all Marines carry Combat Pill Packs with the correct medications; (OTFC and Pill Packs for USMC/USN was an initiative by CAPT Jeff

Timby, the previous II MEF Forward Surgeon); Recon corpsmen carry parenteral antibiotics – 8404s do not; RECON corpsmen like the CRoC and carry it routinely; the CRoC is carried preassembled; the CRoC MUST be rechecked after application; 8404s do not carry the CRoC; TXA is carried by RECON and MARSOC corpsmen, but not by 8404s. (Bastion Role I – USMC/USN)

Chest Seals (e.g. Asherman, Bolin, Halo, Hyfin, Russell, Sam) are variable in their adhesive abilities. Is the flutter valve beneficial? (Role I – USMC/USN) Is the chest seal itself beneficial? Or, does it convert a sucking chest wound into a life-threatening tension pneumothorax? “Why do we treat a non-lethal condition (open pneumothorax) with an intervention that may result in a lethal condition (tension pneumothorax)?” (Incoming JTTS Deployed Director) If the size of the chest seal defect is larger than the diameter of the trachea, then air will preferentially move through the chest defect which can be fatal. Many of the chest seals are being placed on small defects which could lead to a tension pneumothorax. (Outgoing JTTS Deployed Director) According to the 2012 study by Eastridge, there were no fatalities during OEF and OIF that were attributed to open pneumothoraces. **[Eastridge BJ, Mabry RL, Seguin P, et al. Death on the Battlefield (2001-2011): Implications for the Future of Combat Casualty Care. Journal of Trauma and Acute Care Surgery 2012; 73(6) Suppl 5:431-437.]** It is unknown whether modifying the current practice of treating an open pneumothorax with an occlusive chest dressing might cause some of these injuries to then result in fatalities. (CoTCCC Chairman)

233. If the US JFAK is implemented, the bag needs to be functional. (Bastion Role I – USMC/USN) The UK IFAK has a functional bag/container. (Bastion Role I – UK forces)

234. Current Cric Kits are not optimal. Need to optimize and simplify insertion technique, tube lumen size, and tie-down. (Bastion Role I – USMC/USN)

235. USMC/USN medics carry both crystalloid (LR and NS) and colloid (Hextend) IV fluids. (Bastion Role I – USMC/USN)

236. For pain management, Recon and MARSOC medics carry morphine (IV and IM), OTFC, and ketamine. Corpsmen in other Marine units carry only morphine IM. All desire ketamine autoinjectors. (Bastion Role I – USMC/USN)

237. Ketamine was very useful in a recent casualty who had a GSW to the head and significant trismus. The corpsman was initially unable to insert the King LT. He used ketamine (50 mg) which relaxed the trismus and allowed the King LT to be inserted. (Bastion Role I – USMC/USN)

238. There was unanimous agreement among the USMC/USN physicians and corpsmen interviewed that having a ketamine auto-injector would be a very desirable addition to battlefield analgesia options. (Bastion Role I – USMC/USN physicians and corpsmen)

239. Tranexamic acid (TXA) is carried by Recon and MARSOC medics. It is not being carried by corpsmen in other Marine units. (Bastion Role I – USMC/USN)

240. Cardiologists have used the FemoStop for junctional hemorrhage control following procedures in the hospital. The FemoStop compression device should also be considered for potential pre-hospital application and included during future head-to-head evaluations of junctional tourniquet devices. (Bastion Role I – USMC/USN Cardiologist)

241. PJs and aircrews are all on flight status. Mobic was only approved for the USAF flight community 6 months ago. Rated aviation personnel must be ground tested for meloxicam (Mobic) for 7 days. Motrin in contrast does not require ground testing. Thus, if meloxicam is preferred over platelet-inhibiting NSAIDS, then the issue of ground testing for this medication needs to be reviewed. (BAF Role I – USAF)

242. The opioid analgesic option with the best-documented safety record in this conflict is oral transmucosal fentanyl citrate (OTFC). **[Wedmore IS, Kotwal RS, McManus JG, Pennardt A, Talbot TS, Fowler M, McGhee L. Safety and Efficacy of Oral Transmucosal Fentanyl Citrate for Prehospital Pain Control on the Battlefield. Journal of Trauma 2012, 73(6) Suppl 5: 490-5.]** Some units have not been able to obtain this TCCC-recommended analgesic option. (Salerno Role I – 101st Airborne Division (AASLT))

243. First responders expressed dissatisfaction with the weight and bulk of the Hypothermia Prevention and Management Kit (HPMK). (Role I – 75th Ranger Regiment)

244. Combat wound pill packs (CWPPs) are being used by Special Operations ground units. (BAF Role I – CJSOTF; Tarin Kowt Role I – NSW; Role I – 75th Ranger Regiment) Centralized packaging of CWPP medications with extended shelf life would prove beneficial for some units.

245. Many intraosseous infusion devices are found to be non-functional upon arrival at the Role II and Role III facilities. (JTTS Deployed Director)

246. In addition to Cox-1 NSAIDs, other medications to include selective serotonin reuptake inhibitors (SSRIs) may also inhibit platelet function. (BAF Role I – 1st Infantry Division) Medications being administered to combatants in theater should be reviewed for their possible effect on coagulation and prescribed only when the therapeutic benefit is perceived to outweigh the increased risk of death from hemorrhage if the individual is wounded.

247. Potential platelet donors at the Kandahar platelet apheresis center are rejected if they have been on recent aspirin, ibuprofen, or other NSAIDs. (KAF Role III)

248. Evacuation aircraft carry compressed gas cylinders with oxygen to use for casualty care. (BAF Role I – Shadow DUSTOFF; Bastion Role I – UK MERT; Bastion and BAF Role I – USAF Pararescue personnel)

249. Medics noted that the FAST IO is very slow when blood is being infused. The EZ-IO humeral is faster but is much more easily dislodged. (Tarin Kowt Role I – NSW)

250. SEAL IFAK is very complete; includes 2 x SOFT-T tourniquets, TCCC Card, NPA, combat wound pill pack (Mobic 15mg, Tylenol 650mg, Moxifloxacin 400mg), 2 HALO chest seals, 14 GA 3.5” Needle for chest decompression, and 2 x combat gauze. (Tarin Kowt Role I – NSW)

251. The SEAL medics interviewed preferred the SOFT-T tourniquet to the Combat Application tourniquet. One medic suggested that a hybrid tourniquet be developed that incorporates the best features of the CAT and the SOFT-T. (Tarin Kowt Role I – NSW)

252. SEAL medics requested clarification on the use of the nasopharyngeal airway in blunt head trauma casualties. This is part of the TCCC recommendations, but SOCM students are taught not to use the NPA in blunt head trauma casualties. (Tarin Kowt Role I – NSW) The JTTS Deployed Director noted that blunt head trauma is not a contraindication to NPA use.

253. Each SEAL operator carries a morphine 10mg IM auto-injector for battlefield analgesia. SEAL medics noted that OTFC works better than IM morphine and is often given in conjunction with IM morphine. SEAL medics do not routinely carry ketamine. (Tarin Kowt Role I – NSW)

Other:

254. In light of the recent Green on Blue occurrences, it is essential that all Afghan casualties be searched prior to admitting them to the hospital. (Role III – KAF Commander)

255. It is imperative that a thorough security check to include a complete search of the casualty's person be done on all Afghan casualties before they are loaded onto evacuation platforms. (Bastion Role I – UK medics and physicians)

256. In terms of mobility, to what extent have our military forces sacrificed the situational awareness and flexibility of former vehicle platforms for the heightened protection provided by current vehicle designs? (Salerno Role I – CJSOTF) Too much PPE can create a defensive posture and negate the tactical advantage of an offensive posture. (Salerno Role I – CJSOTF; Role I – 75th Ranger Regiment Combatant Leader)

257. The quantity, severity, and mechanism of injury of combat casualties vary by unit role on the battlefield. (e.g. Battle space owner versus assault element – deny terrain versus offensive operations.) (Role I – 75th Ranger Regiment Combatant Leader)

258. Build strength in the force, not resilience. Strength is proactive, whereas resilience is reactive. (Role I – 75th Ranger Regiment Combatant Leader)

259. Human performance programs are paramount. If tailored to the individual, the unit, and the mission, these programs will play a major role in injury prevention, injury tolerance, and injury recovery. (JTS Trauma Care Delivery Director)

260. The medical community exists to provide the line with confidence. (Role I – 75th Ranger Regiment Combatant Leader)

261. Multiple 75th Ranger Regiment combatant leaders and first responders made themselves available to the pre-hospital assessment team in Afghanistan. This underscores the fact that these personnel view themselves as an integral part of the pre-hospital casualty response system. (JTS Trauma Care Delivery Director)

262. Here is what SEAL units need to improve combat trauma care in theater: 1) a Forward Surgical Element dedicated to CJSOTF operations; 2) maintain good SEAL SOCM medics; 3) we need better definition, quantification, and treatment of TBI – both blast vs blunt trauma; and 4) optimized physician medical leadership in combat trauma care. (Tarin Kowt Role I – NSW Combatant Commander)

263. All UK ground forces are wearing protective undergarments to protect against urogenital injury from dismounted IED attacks. (Bastion Role I – UK medics)

264. There are three Mobile Trauma Bays (MTBs) in theater, each staffed with a Mobile Trauma Team (MTT) comprised of an Emergency Medicine physician, a physician assistant,

and a nurse. The MTB is basically an armored container box that is protective against small arms fire. It requires a Logistic Vehicle System Replacement (LVSR) to move. While the concept of moving the MTB close to the battle to provide life-saving casualty care as quickly as possible may be very useful in classic USMC maneuver operation, it has been difficult to employ effectively in the counterinsurgency and village stability operations currently being conducted in Afghanistan. (Bastion Role – USMC/USN physician)

I. RECOMMENDATIONS (SUSTAINS AND IMPROVES)

Secretary of Defense:

1. Command-direct an on-going 100% preventable death review and analysis of all combat-related fatalities to be conducted by a joint team from both the Armed Forces Medical Examiner and the Joint Trauma System
2. Command-direct an on-going review and analysis of preventable deaths in CJOA-A as they relate to tactics, techniques, and procedures (TTPs), tactical trends, personal protective equipment (PPE), evolving injury patterns, and OPTEMPO through a consolidated registry of findings from formal tactical investigations and theater-wide tactical operations interfaced with the DoD Trauma Registry
3. Support designation of the Joint Trauma System (JTS) as a DoD Center of Excellence and as the lead agency for Trauma Care and Trauma Systems. The JTS should remain the source for best-practice trauma care guidelines to be recommended to the services.
4. Support TCCC realignment under JTS with POM support, and strengthen its role in providing best-practice pre-hospital trauma care recommendations
5. Develop a TCCC Rapid Fielding Initiative to fast-track new TCCC techniques & technology to deployed and deploying combatant units as requested.
6. Implementation of a TCCC Rapid Fielding Initiative should include a rapid fielding team of subject matter experts that conduct visits to deployed and deploying forces, issues and transitions supplies and equipment, and provides hands-on training and testing of knowledge.
7. A battlefield death, KIA and DOW, registry must be initiated and maintained.
8. The Joint Trauma System (JTS) must perceive and be perceived as a Service-neutral entity. The JTS must operate with agile access and accessibility to the Services and the COCOMS. Consider realignment of the JTS under the Joint Surgeon's Office, or equivalent Joint solution, in order to meet these requirements and optimize mission success. However, maintain current operating location at the Battlefield Health and Trauma Research Institute. This location facilitates relationships with a Joint medical research complex as well as a Joint Level I Trauma and Burn Center.

Service and Combatant Commanders:

1. Line commander priority, emphasis, and understanding of their tactical casualty response system is critical to success (e.g. 75th Ranger Regiment Casualty Response model)

2. Train all combatant unit personnel in basic TCCC initially, annually, and within 6 months of combat deployment (e.g. USSOCOM Directive 350-29 model). This should be a requirement for deploying to a combat theater.
3. Train all medical personnel (physicians, PAs, nurses, medics) in instructor-level TCCC courses initially and within 6 months of combat deployment. This should be a requirement for deploying to a combat theater.
4. Integrate TCCC-based casualty response into battle drills, small unit tactics, and training exercises at all levels (e.g. 75th Ranger Regiment Casualty Response model).
5. Support enduring sustainment hands-on trauma training for all pre-hospital medical personnel (Live Tissue & Trauma Center Rotations) (e.g. USASOC Regulation 350-1 model).
6. Advance pre-hospital care and improve performance through Point-of-Injury (POI) care documentation (TCCC Casualty Card, JTS AAR, unit-based registries) directed by line commanders (e.g. 75th Ranger Regiment Casualty Response model).
7. Advance pre-hospital evacuation care and improve performance through TACEVAC care documentation (TCCC Casualty Card, Run Sheets) directed by line commanders.
8. Emphasize contingency planning to ensure evacuation capabilities in non-permissive environments.
9. Casualty response systems should be measured as a combatant unit priority for combat deployment, as well as an enduring requirement for training and readiness. A “go / no go” criteria with command attention should be enacted and reflected on a Unit Status Report (USR) or an equivalent reportable mechanism.
10. Point of injury pre-hospital trauma care documentation should be obtained for all casualties using a redundant data capture system that includes: 1) documenting care when tactically feasible during a mission using the TCCC Casualty Card (DA Form 7656 or DoD equivalent), 2) documenting care within 72 hours following a mission using the JTS TCCC AAR system, and 3) establishment of unit-based registries in order to provide near real time feedback to commanders.
11. As conventional forces of the future are chartered to become more SOF-like, and to conduct more unconventional missions, other major commands should review USSOCOM Directive 350-29, Special Operations Forces Baseline Interoperable Medical Training Standards, and USASOC Regulation 350-1, Appendix G, Medical Sustainment Training. Requirements and practices depicted in these documents should be considered by other major commands as applicable.
12. Human performance programs are paramount. If tailored to the individual, the unit, and the mission, these programs will play a major role in injury prevention, injury tolerance, and injury recovery. Review and consider USSOCOM human performance programs as a model for expanded efforts throughout the U.S. military.
13. The Army Medical Department (AMEDD) Center and School has combat arms instructors embedded in its structure in order to accommodate basic warfighting TTPs and ideology.

Medical instructors should also be embedded in the structure of basic combat arms centers and schools in order to accommodate basic pre-hospital lifesaving skills and ideology applicable to all first responders. Non-AMEDD leadership schools at all levels should also integrate medical instructors to optimize TCCC and pre-hospital casualty response training for leaders.

14. Services should monitor TCCC and combat medical training courses to ensure that content and variations from CoTCCC recommendations are approved by service medical leadership and based on best practices and appropriate levels of evidence.

15. Combatant Commanders and Surgeons outside of CENTCOM should review this report, implement applicable recommendations for readiness and contingency planning prior to an outbreak of conflict in their area of operations, and be prepared to perform recommended tasks as provided to CENTCOM. Lessons learned are not lessons learned unless we learn them.

Service Surgeons General:

1. Sustain and expand initiative to train and sustain all tactical evacuation medics as Critical Care Flight Paramedics (e.g. 160th Special Operations Aviation Regiment (Airborne) model; AFSOC model; newly implemented AMEDD model)

2. Support and expand USFOR-A initiatives to develop an advanced tactical evacuation capability for the critically injured – blood, plasma, advanced airway interventions, advanced provider teams (e.g. UK MERT model)

3. Implementation of initiatives to develop advanced tactical evacuation capabilities for the critically injured should consider three components: 1) Medical capabilities (advanced training, provider teams, forward damage control resuscitation techniques - blood, plasma, other), 2) ground vehicle and aircraft capabilities (configuration, markings, ground and airframe, technology, weapon systems), and 3) pilot and crew capabilities (advanced ground and flight training, weapons training). All methods and facets of tactical evacuation should be explored to optimize successful mission accomplishment. A dedicated aircraft should not dictate the mission requirement; the mission requirement should dictate a dedicated tactical evacuation capability. An intelligent tasking algorithm and matrix should be developed.

4. Professionalize the force; review and refine a career pathway for military pre-hospital medics. Although a senior medical NCO should be a master of his craft, current advancement opportunities are weighted toward non-medical attributes and skills. Consider technical advancement and autonomy of practice for senior medics (both flight and ground) through Emergency Medical Technician-Paramedic training. (e.g. United Kingdom model) Consider commensurate compensation for maintaining paramedic credentials (e.g. Jump, Dive, Flight status model), as well as a paramedic tab to readily identify and denote achievement of the advanced paramedic skill level (e.g. Ranger Tab model).

5. Review and refine a career pathway for military pre-hospital physician assistants. Significant prior combat medic experience should be a major selection factor for the interservice physician assistant program. Historically, experienced prior service medics were selected for physician assistant training and then served for extended periods of time in combatant units. They were the center of gravity, medical continuity, and pre-hospital expert in a combatant unit. Over the past two decades, the selection criterion for physician assistant training has changed to

accommodate lesser to no prior medical experience, and extended assignments with combatant units are now discouraged. Pre-hospital career paths should be encouraged and pre-hospital subject matter experts should be created and sustained. Additional training opportunities should include critical care, trauma, and emergency medical systems fellowships.

6. Review and refine a career pathway for military pre-hospital nurses. Some nurses will obtain a highly valued skill set in emergency, critical care, and transport medicine. Sustainment and training of these skills is paramount. Advancement opportunities within this career field must be created. Standardize the equipment, training, protocols, and readiness level progression for ECCNs. Establish training for medical directors to approve ECCN specific protocols. Establish ECCN PROFIS positions, assign ECCNs to MEDEVAC units prior to pre-deployment training, and deploy ECCNs with the MEDEVAC unit for the duration of the unit deployment.

7. Review and refine a career pathway for military pre-hospital physicians. Pre-hospital emergency medicine is truly a multi-disciplinary area of medical practice. Traditionally, physicians have volunteered to work in this area without any formal training or career structure. Continue to support, refine, and expand the military Emergency Medical Services fellowship to accommodate needs of all services. A physician mentorship program needs to be developed. Additionally, review and adopt best practices from pre-hospital emergency medicine subspecialty programs found in other nations (e.g. United Kingdom model).

8. Currently, there is no one entity focused on pre-hospital and battlefield medicine. Create and maintain a command structure for pre-hospital and battlefield medicine. For battlefield trauma care, obtain best-practice recommendations and guidelines from the Joint Trauma System.

9. Review service trauma training center programs (ATTC, NTTCC, CSTARS) and consider creating Joint Trauma Training Centers (JTTCs). We should train as we fight. All services work jointly in theater, home station trauma training programs should accommodate the same. Best practices from current service trauma training center programs should be cross-leveled. Other services would benefit from reviewing current US Air Force trauma training center model. Increase civilian community visibility and ownership of National defense efforts through civilian-military trauma training center partnerships. JTTCs should accommodate pre-hospital trauma training for combatant unit (ground and aviation) medical personnel.

10. Mission requirements and standards of care should dictate medical training standards. All military pre-hospital medical providers should receive initial and sustainment training to accommodate all administration routes (PO, IV, IM, etc.) of all medications recommended by TCCC for optimal provision of pre-hospital trauma care on the battlefield.

11. Crew chiefs and gunners on tactical evacuation missions should be trained at least to a minimum standard of Emergency Medical Technician-Basic as they may be requested to assist in casualty care.

12. As the DoD joint military medical school, the Uniformed Services University of the Health Sciences (USUHS) must continue to expand and institutionalize their direct participation, research, and training in trauma and combat casualty care delivery across services and throughout the continuum of care. USUHS should also develop and formalize a partnership with the Joint Trauma System.

Research and Development Commanders:

1. Elevate the priority of pre-hospital trauma care research and funding and emphasize the need for advances in non-compressible hemorrhage control and resuscitation of casualties in shock in the pre-hospital environment.
2. As all on the battlefield have the potential to be a casualty and a first responder, explore information technology (IT) solutions for pre-hospital documentation that are first responder centric, not medic centric, and integrated into tactical communications in a manner that surpasses the proven TCCC card method.
3. As nausea and emesis can occur with opiate administration, develop an oral transmucosal fentanyl citrate lozenge with ondansetron ("fentanyl-ondansetron swirl lollipop").
4. Develop an oral transmucosal ketamine lozenge product ("ketamine lollipop").
5. Similar to the IM auto-injector used for morphine, develop a ketamine 50mg IM auto-injector for pre-hospital trauma care. Explore other potential routes of ketamine administration to include intranasal and transcutaneous.
6. Determine whether TXA administered IM is equal in efficacy to TXA given IV. If this is found to be the case, develop a tranexamic acid (TXA) 1g IM auto-injector for pre-hospital trauma care.
7. As malaria chemoprophylaxis mitigates morbidity and mortality caused by malarial infection, develop an animal model research protocol to study the safety, efficacy, risk, and benefit of oral TXA consumed prophylactically for mitigation of uncontrolled hemorrhage.
8. According to the 2011 Eastridge et al DOW study and the 2012 Eastridge et al KIA study, no deaths occurred as a result of a sucking chest wound. However, 11 deaths were attributed to tension pneumothorax. Although the report is pending publication, a recent study conducted by the USAISR to evaluate benefit versus non-benefit of a chest seal valve noted a benefit for a chest seal valve. Another study should be conducted to ascertain the need for applying a chest seal to a sucking chest wound, as a sucking chest wound may still be inadvertently converted into a life-threatening tension pneumothorax.
9. New FDA-approved technology to control junctional hemorrhage should be compared and further evaluated. Compression devices used in the hospital setting (e.g. FemoStop) should also be included in future head-to-head evaluations of junctional tourniquet devices to determine potential for use in the pre-hospital setting.
10. Evaluate outcomes as a function of pre-hospital fluid resuscitation (none vs. hextend vs. plasma vs. PRBC vs 1:1 plasma and PRBC) provided by evacuation platforms.
11. Take the best features of the CAT tourniquet and the SOF-T tourniquet and develop a hybrid that outperforms both.
12. Study the safety and efficacy of pre-hospital pelvic binder use on casualties with known or suspected pelvic trauma.
13. Conduct a review of pre-hospital spinal precautions in the tactical environment.

14. Develop a centrally packaged and distributed Combat Wound Pill Pack. This pack must include extended shelf life for components as well as packaging that will ensure integrity of components against crush and humidity.
15. As meloxicam (Mobic) is preferred over platelet-inhibiting NSAIDS for personnel at risk for wounding and subsequent hemorrhage in a combat zone, review and evaluate whether meloxicam truly requires 7 day ground testing for rated aviation personnel.
16. Conduct a retrospective study of combat casualty outcomes in the DoD Trauma Registry as a function of the type and route of pre-hospital analgesia used as well as the type and severity of wounds sustained and physiologic parameters indicative of circulatory or respiratory status.
17. Information Technology systems must be employed to optimize the consolidation, synthesis, and analysis of information and data for tactical and medical performance improvement.
18. Many potential first responders routinely play popular combat video games (e.g. Halo, Call of Duty, Gears of War). Partner with the makers of these games and integrate accurate first responder TCCC treatment protocols for casualties in the game, based on injuries and injury requirements.
19. Integrate and solicit input from medics, and other pre-hospital trauma experts, from the onset and throughout the process of pre-hospital trauma research and development in order to optimize requirements-based solutions.
20. DoD research efforts must meet the needs of the combatant commander and the mission. As health, wellness, and disease prevention should continue to serve as focal topics of advancement through non-DoD funded medical research, DoD funded medical research must maintain focus on unique aspects of "military" medicine and fund projects designed to fill gaps in force health protection, human performance, injury prevention, and combat casualty care.

CENTCOM Commander and Surgeon:

1. Continue support for the Joint Theater Trauma System (JTTS) Deployed Director position in CJOA-A.
2. Create and support the position of JTTS Pre-Hospital Care Director in CJOA-A to be filled by a physician with experience in POI pre-hospital combat trauma care
3. Minimize use of platelet-inhibiting drugs (e.g. aspirin, Motrin, other COX-1 NSAIDs, SSRIs) in individuals who leave secure areas for combat missions in CJOA-A
4. Expand TCCC-endorsed trauma guidelines, training, and use of 1) tranexamic acid (TXA); and 2) ketamine to all pre-hospital medical providers in CJOA-A (e.g. USSOCOM model)
5. Implement JTS endorsed pre-hospital guidelines in the same fashion as JTS endorsed hospital guidelines

6. Maintain, update, and publish a list of platelet-inhibiting medications and nutraceuticals that should not be used in individuals who depart secure areas and conduct combat missions, as these individuals are at higher risk for trauma and increased morbidity and mortality from hemorrhage.
7. Review and improve the theater policy and approval pathway for off-label use of medications in the pre-hospital battlefield environment in order to mitigate restrictions placed on beneficial practices endorsed by the medical literature and subject matter experts (e.g. tranexamic acid, oral transmucosal fentanyl citrate, ketamine).
8. In addition to creating a deployed JTTS Pre-Hospital Care Director, deploying and deployed command surgeons must be knowledgeable on pre-hospital battlefield trauma care and its impact on battlefield morbidity and mortality. These providers must dedicate additional resources toward equipping and training all personnel on pre-hospital care and documentation.
9. The JTTS should provide routine performance improvement feedback to combatant commanders and surgeons on pre-hospital trauma care to include POI treatment, documentation, and appropriateness of evacuation categorization.
10. Explore all options to enable intranasal ketamine for pre-hospital analgesia in combat casualties.
11. Standardize the requirement for a critical care trained provider on critical care transfers, and ensure trained medical directors are available to approve ECCN specific protocols.
12. MEDEVAC Standard Operating Procedures (SOPs) vary between units. Consider publishing frago to align MEDEVAC procedures and protocols in CENTCOM, and recommend the same throughout FORSCOM.
13. Role III medical providers in theater provide medical documentation for 100% of trauma casualties. Role II and Role I medical providers should provide the same. Mandate medical documentation at all levels of medical care in theater. Consider publishing frago to align specific medical documentation and after action report requirements.

Joint Trauma System

1. Conduct routine DoD Trauma Registry analysis on pre-hospital (POI and TACEVAC) care documentation and TCCC interventions and provide feedback to JTTS and CENTCOM Commanders and Surgeons.
2. Request additional resources, or realign existing resources, to accommodate pre-hospital (POI and TACEVAC) performance improvement.
3. Using Eastridge et al categorization for KIA (instantaneous versus acute), reconfigure study of evacuation times to include acute KIAs in the analysis.
4. Consider partnership with US Army Aeromedical Research Lab (USAARL) on evacuation study protocols.

5. Plan for and conduct recurring internal and external reviews of pre-hospital trauma care in active combatant command areas of operations.
6. Plan for and conduct recurring in-theater pre-hospital trauma conferences.

Committee on Tactical Combat Casualty Care

1. Add CENTCOM Pre-Hospital Care Review as agenda item to next CoTCCC meeting.
2. Send a TCCC update package to theater when changes are made to TCCC Guidelines.
3. Ensure that CSTARs, NTTC, and ATTC are on the direct mail TCCC curriculum update list.
4. Consider adding current theater TACEVAC blood protocol to the TACEVAC chapter in the PHTLS Manual.
5. Add to TCCC instructional materials: A thorough security check and complete search must be done on all enemy and LN casualties before loading onto evacuation platforms.
6. Add to TCCC instructional materials: Evacuation platforms should be prepared to provide resupply bags to ground medics.
7. Add to TCCC instructional materials: Don't tape the casualty's head to the litter when a cervical spine injury is suspected without taping and securing the rest of the body.
8. Add to TCCC instructional materials: Some carry tourniquets in lower leg location. This is a suboptimal practice as the lower leg is often affected by IEDs.
9. Reinforce in TCCC instructional materials: Ground medics need to fill airway cuffs with saline prior to air evacuation, otherwise inflated cuffs will expand at altitude.
10. Discuss with DMMPO: UK IFAK has "roll-out" configuration and standardized storage compartments like that commonly seen with roll-out bags on evacuation platforms. This expedites finding and applying critical life-saving equipment, especially at night.
11. Consider simplification of TCCC pre-hospital pain management protocol to three treatment options: 1) Able to fight - Mobic and Tylenol, 2) Unable to fight and in no risk of shock – OTFC 800 mcg, 3) Unable to fight and in or at risk of shock – Ketamine 50 mg IM.
12. Conduct literature review of acetaminophen IV and/or IM and determine cost and benefit for pain management on the battlefield as compared to PO route as well as other analgesics.
13. Clarify in TCCC instructional materials that ketamine should not be given IV push.
14. Clarify in TCCC instructional materials that OTFC lozenges should not be chewed, but allowed to dissolve.
15. Clarify in TCCC instructional materials that the c-spine cannot be cleared pre-hospital if the casualty has received opioids or ketamine. A mental status exam should be documented prior to administering ketamine or opioids.

16. Consider adding ondansetron as an option for managing nausea and emesis on the battlefield.
17. Review the use of c-collars and pelvic binders in TCCC.
18. Revisit the technique, training, and technology for surgical airways. Loss of consciousness in the absence of airway obstruction is not an indication for a surgical airway.
19. Review surgical airway indications. Surgical airways are being performed on casualties with GSWs to the head when there is no evidence of airway obstruction. Basic airway management techniques may be more appropriate.
20. Consider adding supraglottic airways as an airway option in Tactical Field Care as well as TACEVAC Care.
21. Simplify and clarify the TCCC airway algorithm.
22. As multiple deployed personnel noted training and placement of tourniquets exclusively in a “high and tight” versus simply proximal to extremity wound location, consider providing additional TCCC tourniquet placement clarification in TCCC instructional materials.
23. Consider adding the FemoStop compression device and other junctional pressure devices to the options for control of junctional hemorrhage.
24. Consider recommending the FAST-1 IO as the primary for TFC, and EZ IO as primary for TACEVAC.
25. Re-evaluate the role of the chest seal in the management of an open pneumothorax.
26. Provide additional clarification for use of Combat Ready Clamp to emphasize its potential improved employment when carried on evacuation platforms in a pre-assembled configuration.
27. Continue to investigate other options for hypothermia prevention.

J. CONCLUDING REMARKS

Pre-hospital combat death can be prevented by combatant and medical leaders at multiple levels through:

1. **Primary prevention** – prevent injury incident through TTPs and evidence-based findings from tactical and medical After Action Reviews (AARs)
2. **Secondary prevention** – mitigate injury extent through tactical contingency planning and Personal Protective Equipment (PPE)
3. **Tertiary prevention** – optimize injury care through properly executed TCCC, optimized tactical casualty response (POI and Evacuation), and forward damage control resuscitation

Medically, the key to trauma care delivery is the time to a required (injury dictated) capability (successfully performed). However, ultimately, the solution to trauma care delivery, and subsequent reduction of preventable combat death, is **both tactical and medical**, and therefore must have the attention and support of combatant commanders.

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